The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. I. OCTOBER 4, 1919 No. 16.

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- Abroad. Cheques, P.O.O.'s, and Postal Orders should be payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.
Telegrams: "Allangas, Fleet, London." ***Telephone: City 9852 (4 lines).***

The Strike

IF the negotiations between the railwaymen and the Government were still open, it would be of the highest importance to the formation of an equitable judgment to have the men's claims on the one side and the Government's offer on the other set out in clear contrast and specific terms. But these and all other details have for the moment been sunk in one much bigger issue. The N.U.R. executive have struck suddenly, and with their whole force—precipitately, as even their own constituents now allow; deliberately and with calculation, as they must themselves confess; unjustifiably, as the whole community emphatically think. Above all, they have struck against the Government representing the whole nation, and the weapon on which they rely for success is the complete arrest of national industry and the swift starvation of the community in submission. It is the act of an executive; not, it must steadily be remembered, of the men in whose name they act. With any genuine grievances of railwaymen, or of any other body of public servants, the public would have every sympathy; with this irresponsible action of a handful of so-called leaders, apparently intoxicated by a sense of their power over a great industrial machine, the public have convincingly shown they have none.

On the central issue there must be plain speaking. There was a ruthlessness about the spirit in which the executive challenged the nation that strongly recalled the methods of the Prussian Junker. As deliberately as the Kaiser moved the lever which set the war machine in motion, to the horror of all civilised peoples, the railwaymen's executive moved the lever which set going this revolt against democracy and collective social life. It is anti-democratic, because it subverts the rights and welfare of the whole nation to the selfish interests of one class; it is anti-social, because, if adopted all round, it would dethrone rational and orderly government and substitute brute force. Already we suspect the leaders who precipitated so grave a conflict have recognised that their tactics were mistaken. Like the submarine campaign, which was intended to terrorise, it has, instead, merely called up against itself a tide of moral indignation which must end in its defeat. The moral sense of the nation is dead against the executive. That is the plain truth of the matter. If all the trade unions of the country came to the aid of the executive—and we trust they will make no such false move—the fundamental issue would still be unchanged, and the duty of the nation to prevent the interests of the whole community from being over-ridden by an organised minority would remain. This does not mean opposition to any reasonable demands of railwaymen, or of any other body of workers. It simply means that if society is to hold together, every section must recognise its obligation to the whole, of which itself is a part. The present policy of bringing the trade of the nation to a stop in order to enforce sectional demands can end in nothing but national ruin, and if the trade unions used their combined strength to produce this result they also must inevitably go down with the rest of us. If there are any who joyfully contemplate such a result, their attention may profitably be directed to Russia.

Facts the Unions Must Face

WITHOUT expressing a judgment on the particular monetary claims in the dispute—which, indeed, are small beside the fundamental issue—a few observations on the broader aspects of the case may be offered for the consideration of reasonable trade unionists.

1. Any rational inquiry into the merits of this and similar cases might well begin with the point Mr. Ernest Benn makes on another page—that it is nonsense to expect five years of war to be followed by a jolly good time for everybody. We agree that some recent rhetorical appeals are responsible for awakening such false hopes in the minds of the unthinking. But it is impossible.

The war must be paid for, and everyone will have to pay his share. It seems to be assumed that it is somebody's or everybody's duty to see that members of trade unions are put back into at least as good a position as they occupied before the war. Such an assumption ignores the heavy legacy of the war. Neither trade unionists nor any other class can escape their share of the penalty. The simple truth is that the world is poorer, and (with the inevitable few exceptions) all of us must be content to be poorer until recovery is achieved.

2. If workers, feeling the pinch, desire to ease the pressure, they must look for some deeper remedy than the perpetual advance of paper wages. It is no advantage to the worker to get £1 a week more if, largely by his own policy of restricting and even reducing output, he forces a corresponding advance in the price of all the commodities his money buys. The real remedy must come from the other end—from the increased production and consequent cheapening of all the necessaries of life. And that remedy the worker must himself apply. To demand higher wages and shorter hours, and at the same time deliberately to limit production far below the normal productive capacity of the worker, is to negative the benefits of higher wages and to perpetuate the conditions against which he protests. There is a ray of real hope in the fact that labour leaders are at last summoning up courage to tell the workman the plain truth—that recovery, in which he is as much interested as any class, can only come through work.

3. Those who control trade union machinery will do well to remember that industrial prosperity does not come like manna from above. Every business which employs labour is the result of the capital, direction, enterprise and risk of someone other than the worker. The uneducated or (worse still) the half-educated type of labour official seems to think that industry and profits are always there, and that his sole concern is to extract as large a share as possible. It is necessary to remind such that industry may not be always there, and that if it is killed or diverted to other countries the workers will be among the first to suffer.

4. Finally, the trade unionist may be reminded that his organisation was created to resist class ascendancy and monopoly. The unions rose in their own defence against capitalist "rings," "trusts," and "combines." They would be false to their own history if now they sought to use against society the very weapons they protested against the employing class using against themselves. The trade unions will in the end gain nothing by organising a great campaign against society. The growth of their organisation and power is explained by the fact that in the main they have carried with them the moral sense of the country, and their future progress lies assuredly along that line.

As regards the effect of the strike on the chemical industry, we learn that already it has been sharply felt. Markets are described as "upside down," and prices have jumped about spasmodically. Firms can neither get stuff out of their works, nor get raw materials in. Most serious of all will be the effect, should the strike continue, upon continuous processes, the restoration of which, once interrupted, may require weeks. Fortunately, as we write, the position looks a little more hopeful. The frankest thing is for the strike leaders to recognise that in striking against society they made a fundamental mistake, from which, in the end, the men they represent must suffer as much as the rest, if not more. Once that is admitted the way will be clear for a sympathetic hearing of any grievances the railwaymen may have.

Carbide and Acetylene

THE use of acetylene, and therefore calcium carbide, has received a considerable impetus during the war, and is already well established for lighting, welding, cutting, and similar purposes. On the other hand, enormous quantities of carbide have been made in nearly all countries for conversion into fertilisers and nitric acid. The change over to peace programmes may possibly at first result in over-production, and prices are likely to be lower for some time from this cause, as was the case in the early days of the carbide industry. The German output is also a factor to be seriously reckoned with so long as the rate of exchange remains low. In this country carbide factories are both in existence and in contemplation, but unless, as in the case of a Cumberland company, the manufacture of carbide is part of a thoroughly organised whole, commercial success is doubtful. The South African Carbide and By-Products, Ltd., whose prospectus has just been issued, is in a different category, and its progress will be followed with interest.

The natural consequence of possible over-production is a search for new outlets for the products derived from carbide and acetylene, and in this connection the progressive spirit of our Colonial chemical industry is well illustrated by the August number of the *Canadian Chemical Journal*, the entire text of which deals with the wonderful electro-chemical centre of the Empire at Shawinigan Falls, about 85 miles from Montreal. The articles pay tribute to the persistence and ability of the chemists and engineers who have blazed the trail in the primeval forest, constructed huge power plants, and, having harnessed the great St. Maurice River, are converting its energy into metallurgical and chemical products of primary importance. The metallurgical and power plants are tributes to the engineer, but the success of the commercial development of the reactivity of the acetylene molecule is a tribute to the vision and ability of the chemists of the Shawinigan Company in particular, and also to the work of chemists and chemical engineers as a class.

While the retrospective articles are of great value and extreme interest, the article on "The Commercial Synthesis of Organic Compounds from Acetylene," an abstract of which is reproduced in this issue, indicates that the future still holds great possibilities, and further fields to conquer, for those who have the minds to conceive and the hands to execute. Our premier Dominion not only came to the aid of the Empire in connection with military operations, but is now playing a leading part in rendering the Empire independent in the products of peace. By developing those great natural resources which we in the United Kingdom lack, our Colonies will not only be of immense assistance in maintaining the commercial supremacy of the Empire, but will render it immune to foreign tariff restrictions, and assured of domestic supplies in time of stress. The soundness of Imperial development of such centres of

industry was fully demonstrated in this particular case, as the carbide and acetylene industry was urgently needed for supplying at reasonable cost the acetone and acetic acid so greatly in demand for the manufacture of cordite and aeroplanes. It is a lasting tribute to our Canadian colleagues that this industry was planned on sound commercial lines, and cannot be considered a war baby in the accepted sense of that term.

Potash Recovery at Cement Plants

We publish this week the first instalment of a report in which Dr. A. W. G. Wilson describes the results of his investigations, on behalf of the Canadian War Trade Board, into the processes now in operation in the United States for the recovery of potash from flue dust in cement works in a form suitable for industrial purposes. At the present time fifteen cement plants in the United States have installed or are installing potash recovery equipment. Twelve of these were inspected in detail by the author, and his report is intended to place before Canadian firms the general results of the processes employed, with a view to developing a home supply of potash for the Dominion. The report, it may be said at once, is distinctly favourable. In those plants where the equipment was installed two years or more ago the principal source of revenue during the last year of the war was potash recovery. Several plants paid for their entire installation within the first year of operating, and many of them are reported to be confident of their ability to continue in operation under normal conditions. The total output of all potash materials in the United States in 1917 was 126,577 short tons, which contained 32,366 tons of pure potash (K_2O), or 26.4 per cent. —more than three times the production in the previous year. The production in 1918 was almost 53,000 tons of pure potash, out of a total requirement of about 240,000 tons. In 1917 about 45 per cent. of the total production of potash was derived from brines, about 10 per cent. from kelp, nearly 9 per cent. from charred molasses residues, and about 5 per cent. from cement mills. Cement mill production of potash in 1918 was equivalent to 1,429 tons of pure potassium oxide. In addition to the recovery of potash at cement works, three steel plants are recovering potash from their flue gases experimentally.

As regards Canada, potash salts up to now have not been produced there on a commercial scale. Yet the need of potash for fertilisation purposes is felt increasingly, and the Canada Cement Co. is now preparing plans for a potash recovery installation—the first installation of its kind in Canada—at their Port Colborne (Ontario) plant. It is probable that Canada at present consumes only about 1,200 tons of potash (K_2O) per annum in fertilisers, and this is regarded as much too small. Food production, it is stated, not only cannot be maintained, but will show a very marked decline if these salts are not available as plant food. In the future, in addition to other constituents of plant foods, Canada will require much larger quantities of potash salts to maintain grain production in the West. The rapid decline in the acre yield of many areas in Manitoba is considered to be due largely to the removal and export—over a term of years—of important soil chemicals, chiefly potash salts and phosphates, and to the failure to replace these losses. In brief, potash salts are regarded as absolutely essential to food production, and an independent home source of supply for Canada is considered desirable

The Preservation of Eggs

The International Committee of experts which has been engaged on the question, among others, of "What is a new-laid egg?" concluded its deliberations last week. It seems quite desirable that some general standard should be set up, for the wide diversity between the standard of the retailer and the standard of the consumer frequently leads to vexation at the breakfast table. The point, however, before the Committee—the determination of an international standard of quality of eggs—is rather a question for the chemist than for the historian. The practical point is not the date on which the egg was laid, but its chemical condition when it appears on the breakfast table. Properly treated, it is now quite possible to preserve the freshness of an egg for a considerable period; as long, in fact, as the egg retains its wholesomeness as an article of food it matters little to the consumer whether it is a day old or was produced in the Tudor or Early Victorian period. The processes of egg preservation have undergone considerable improvement, and their further improvement and far more general use are much to be desired, in order to avoid the present wastage in one of the most condensed and nutritious forms of natural food. Apart from the preservation of the egg in its natural state, powdered or evaporated egg is now a commercial commodity, though it cannot be claimed that, treated in this way, the product is as convenient for domestic use or as palatable as the natural egg. Still, this is an industry which may yet be capable of great development; and we learn from a member of the Committee that an enormous trade has been done since the outbreak of war in dried and liquid eggs, mainly from China. The real point is that the egg should be fresh as a food, whether it is served up in the shell or in the form of a treated powder, liquid, or even tabloid. The chemist has played a great part in the development of condensed food industries, and the egg may represent yet another profitable field for his activities.

The Late Mr. W. G. Smith

We learn with the deepest regret, which we know our readers will share, of the death of Mr. W. G. Smith, who had been associated with the firm of R. W. Greeff & Co. for the last thirty-five years. Mr. Smith had a very large circle of friends, and was known widely throughout the chemical and colour trade. He was one of the most genial of men, who made friends everywhere, and never made an enemy, and his death comes as a personal loss to the firm and to every member of the staff, and indeed to the industry in general. The funeral took place at West Norwood Crematorium on Thursday, and was largely attended. The Chemical Age has a special reason for regret at Mr. Smith's death. From the first he had co-operated most efficiently in the preparation of our Market Report and Current Prices, bringing to the task the same courteous manner and sound business knowledge which distinguished him in all his dealings, and his association with this Journal in its very earliest days will remain a very pleasant memory.

The Commercial Synthesis of Organic Compounds from Acetylene

By M. J. Marshall

The great importance of calcium carbide as a raw material is not generally realised, and the following review of the possibility of manufacturing a large number of organic products from acetylene should be of special interest at the present time and is worthy of close study. Mr. Marshall is a research chemist at the Shawinigan Laboratories, Ltd., and this paper is an abstract of one which he has just contributed to the "Canadian Chemical Journal."

WHILE the use of acetylene as an illuminant has been well known for many years, its use in the commercial synthesis of organic chemical compounds is of more recent origin. However, the possible commercial utility of acetylene gas, on account of its very high chemical reactivity, has long been recognised by chemists, and attempts to utilise it in this manner date back probably just as far as its use as an illuminant.

This property of acetylene is due largely to the fact that it is a highly unsaturated compound of simple structure, having the formula CH : CH. Thus, not only does it react easily with other compounds, but at the same time the reaction products are quite simple in structure, thus making it possible to manufacture compounds which can be used as starting points in a large number of chemical syntheses. This high reactivity of acetylene makes the number of possible syntheses very large in number, but up to the present time only a comparatively small number of these reactions have been developed commercially.

The present article will not be confined merely to compounds which have been produced on a commercial scale, but patented processes will also be included, as a large number of these embryo processes are certain to be commercially successful in the future.

Hydration of Acetylene

The most important reaction at the present time, from a commercial and technical point of view, is the hydration of acetylene gas to form acetaldehyde, itself the source of many important synthetic compounds. This reaction proceeds according to the equation :

$$C_2H_2+H_2O=CH_3.CHO$$

and takes place only in the presence of salts of mercury. The process evolved by the Canadian Electro Products Co. consists briefly of the following steps :—

1. The production of acetaldehyde from acetylene by passing acetylene gas through large kettles containing aqueous solutions of mercury salts. The aldehyde vapour is separated from the excess acetylene gas by refrigeration. This is then rectified to give a pure acetaldehyde of 99.9 per cent. purity.

2. Oxidation of the aldehyde to acetic acid in the presence of appropriate catalysts. This is effected by passing air or oxygen through the aldehyde under pressure in the presence of catalysts, such as vanadium pentoxide, cerium oxide, manganese acetate, &c. The degree of conversion of the aldehyde to acetic acid is very high. After separating the excess aldehyde by rectification, acetic acid running 99.8 per cent. pure can be obtained.

3. Conversion of the acetic acid to acetone by passage through hot tubes over lime as a catalyst. This proceeds according to the equation :

$$2CH_3COOH=(CH_3)_2CO+CO_2+H_2O$$

This process was operated with reasonable success for about one year, the acetone being shipped to the British Government. However, towards the end of 1917 the manufacture of acetone was stopped, and acetic acid was produced and shipped to the British Government as before. It is not probable that the company will resume the manufacture of acetone, as this material can be produced more cheaply from commercial calcium acetate. It is understood that a plant of this type for the production of acetic acid has been in operation in Germany since 1916.

Other Products from Acetaldehyde

While, therefore, at the present time acetic acid is the main product manufactured from acetaldehyde on a commercial scale, there is no doubt that in the near future acetaldehyde will be the source of many other important organic compounds. This substance is even more wonderful than acetylene with respect to the great variety of reactions in which it can take part.

Paraldehyde.—Another product which has been manufactured for some time by the Canadian Electro Products Co. is paraldehyde. This is manufactured by treating pure acetaldehyde with very small amounts of sulphuric acid. Considerable heat is evolved, and the aldehyde is converted to paraldehyde containing a certain amount of excess aldehyde. This excess aldehyde is finally removed by appropriate means, in order to obtain the pure paraldehyde.

Aldol.—While mineral acids tend to cause acetaldehyde to polymerise to paraldehyde, aqueous solutions of alkalis, on the other hand, cause the so-called aldol condensation, according to the equation :

$$2CH_3 . CHO = CH_3 . CH(OH) . CH_2 . CHO.$$

Thus N. Grunstein (U.S.P. 1234156, Br.P. 101636 [1917]) protects the production of aldol by treating acetaldehyde with calcium or strontium oxide, and a little water. On completion of the reaction this mixture is neutralised with acid, and the aldol is separated by distillation in vacuo. Aldol has been proposed for the preparation of cellulose acetate solvents. It is also used as a source of butadiene for the manufacture of synthetic rubber.

Ethyl Acetate.—If pure acetaldehyde is allowed to stand for about four hours in contact with about 5 per cent. of its weight of finely divided aluminium ethylate, about 90 per cent. is converted directly to ethyl acetate, according to the equation :

$$2CH_3.CHO=C_2H_5OOC.CH_3$$

It should be noticed that this reaction involves the polymerisation of two molecules of acetaldehyde as in the formation of aldol, although the resulting product is entirely different. This is one very good example of the great diversity of reactions in which acetaldehyde can take place.

From a technical point of view this is a promising reaction, as the ethyl acetate produced is of very high quality, while the means necessary to effect the actual conversion are very simple. The great drawback at present, however, is the preparation of the aluminium ethylate. German patent No. 286596 (1913) claims the preparation of this catalyst by the action of anhydrous alcohol on aluminium foil in the presence of a small amount of mercuric chloride. This action is not by any means rapid, and, after solution of the aluminium, it is necessary to free the aluminium ethylate from the alcohol and mercuric salt. This last has also been the subject of several patents.

Acetal.—Acetal is often used instead of aldehyde for carrying out condensation reactions. It results from the combina-

tion of ethyl alcohol and acetaldehyde, according to the equation :

$$2C_2H_5OH+CH_3.CHO=CH_3.CH(OC_2H_5)_2$$

It is prepared by mixing acetaldehyde and ethyl alcohol in the presence of a trace of hydrochloric acid, and an amount of calcium chloride equivalent to 10 per cent. of the weight of the liquid. Two layers form, which are separated, and the upper one repeatedly treated with fresh portions of calcium chloride till no more water separates. The liquid is then shaken with anhydrous sodium carbonate to remove traces of acid, filtered, and fractionally distilled.

Ethyl Alcohol.—Patents have been taken out for the preparation of ethyl alcohol from acetaldehyde by passing a mixture of acetaldehyde vapour and hydrogen over reduced nickel at temperatures below 180°. It is hardly probable, however, that alcohol can be produced as cheaply by this method as by the ordinary fermentation process.

Aldehyde Ammonia.—Aldehyde ammonia has recently come to the fore as an accelerator in the vulcanisation of rubber. This can be prepared by the direct addition of ammonia to aldehyde. The aldehyde is dissolved in anhydrous ether, and dry ammonia gas passed through. The aldehyde ammonia separates as a crystalline solid, which can be separated by filtration.

Chlorination Products of Aldehyde.—Acetaldehyde chlorinates very rapidly, with the evolution of much heat. A mixture of several products is obtained, which, so far, have not found any large commercial use. It is stated that acetyl chloride is formed in this way, although the amount so formed is not sufficiently large to be of technical importance. One of the products appears to be butyl chloral. On the whole, however, very little exact information is available so far concerning the exact nature of the reactions accompanying the chlorination of aldehyde.

Manufacture of Pure Nitrogen.—In the oxidation of aldehyde to acetic acid by means of air, considerable amounts of fairly pure atmospheric nitrogen are obtained. This by-product should certainly find a use in one of the several nitrogen fixation processes at present in existence.

Products from Acetic Acid

From acetic acid a number of interesting products are obtained. Thus by passing chlorine gas into acetic acid in the presence of acetic anhydride monochloracetic acid is obtained. This product is of great importance in the manufacture of indigo.

Acetone.—If acetic acid vapour is passed over lime at a temperature of 450° C. practically all the acid is converted to acetone, with the liberation of carbon dioxide, according to the following equation :

$$2CH_3COOH=(CH_3CO_2)+CO_2+H_2O.$$

It can be seen that in this case the lime acts as a catalyst only. This method of manufacturing acetone cannot compete financially with the ordinary method, consisting of the dry distillation of commercial calcium acetate. This is due to the high initial cost of the acetic acid compared with that of the acetate of lime.

Manufacture of Acetic Anhydride.—Acetic anhydride is an acetic acid derivative of extreme technical importance. It is used very largely in the manufacture of cellulose acetate and synthetic drugs. While cellulose acetate is a more valuable product than cellulose nitrate, nevertheless, at the present time the high cost of acetic anhydride limits its use considerably.

A method for the manufacture of acetic anhydride directly from acetaldehyde has been patented by Société L'Oyonnith (Fr. Pats. 420346 [1910], 442738 [1911]). The aldehyde is diluted with acetic anhydride and treated with chlorous anhydride, Cl_2O. The following reactions are stated to take place :

$$Cl_2O+2CH_3.CHO=(CH_3CO)_2O+2HCl$$

This process, therefore, supplies a means for the production of acetic anhydride directly from aldehyde, without the intermediate formation of acetic acid or an acetate.

Not only can acetylene add on free water to form acetaldehyde, but it can also form aldehyde by actually abstracting water from other chemical compounds, and thus acting as a dehydrating agent. Thus acetylene dehydrates acetic acid in the presence of mercury salts to form acetic anhydride and acetylates. The anhydride so formed immediately acetylates the aldehyde to form an ester of the ethylidene type, known as ethylidene diacetate. If this substance is heated, it tends to break up into aldehyde and acetic anhydride. This last reaction, therefore, opens a door for the manufacture of acetic anhydride directly from acetylene. Considerable attention had been devoted recently to the development of this process in Europe, but there seems to be a number of fundamental difficulties which have not yet been overcome.

The ordinary technical method of manufacturing acetic anhydride is by the action of chlorides of sulphur on sodium acetate. This process has been modified by Goldschmidt (U.S.P. 1195205 [1906]) by mixing sulphur with the sodium acetate and passing in chlorine. In this way the sulphur chloride is formed in contact with the substance on which it is to react. The first product of the reaction is acetyl chloride. This reacts with the excess of sodium acetate at a higher temperature—about 80° C.—to form acetic anhydride. The acetic anhydride is separated from the solid residue by distillation in vacuo.

Compounds of Acetylene with other Substances.—It was found that acetylene in the presence of mercury salt could abstract water not only from acetic acid, but also from most compounds containing a hydroxyl group. G. Boiteau (Fr. Pat. 477560 [1914]) claims the manufacture of entirely new compounds by the action of acetylene on alcohols. Also by dehydrating the product obtained from methyl alcohol and acetylene he obtains butadiene. It would appear, therefore, that this series of reactions alone opens a very wide field to the utilisation of acetylene.

Compounds with Ammonia.—By passing a mixture of ammonia and acetic acid vapour over alumina at 500° C. acetonitrile is formed, according to the following equation :

$$CH_3COOH+NH_3=CH_3CN+2H_2O$$

The yield is 85 per cent. of theory. The nitriles, as is well known, are important substances in organic syntheses.

Esters of Acetic Acid.—It is doubtful whether the manufacture of the commercial grades of esters from high-grade acetic acid would be able to compete with the method of manufacture direct from calcium acetate as now practised. It is possible that where an ester of the higher alcohols were required of a fair degree of purity, acetic acid could be economically used.

It is perfectly obvious that this single property possessed by acetylene—that of adding on water in the presence of mercury salts—is possessed of vast potential industrial importance. Thus, while at the present time the main application of this reaction on a large scale has resulted in the commercial production of acetic acid, no one can prophesy how far the uses of acetylene as a synthetic medium will extend.

This power of adding on water is only one of a large number of additional reactions which can take place between acetylene and other compounds. The remainder of this article will be devoted to a discussion of these reactions.

Chlorination Products of Acetylene

Acetylene combines very violently with chlorine, forming addition compounds. Care must be taken in controlling the reaction, otherwise it is liable to proceed with explosive violence. The main product of this reaction appears to be tetrachlorethane, $C_2H_2Cl_4$, although a little dichlorethylene,

$C_2H_2Cl_2$, is formed at the same time. The following equations represent approximately the course of the reaction :

$$C_2H_2+Cl_2=C_2H_2Cl_2$$
$$C_2H_2Cl_2+Cl_2=C_2H_2Cl_4$$

Practically all patents taken out for the manufacture of tetrachlorethane by this method are for the purpose of preventing, as far as possible, the explosive combination of these gases. One of the most valuable methods appears to be that of Voigt (U.S.P. 908051), who allows the reaction to take place in the interior of a porous mass made of sand, pulverised earthenware, infusorial earth, &c. The fine pores abstract the heat of reaction with sufficient speed to prevent explosion, while at the same time the apparatus is provided with a water jacket through which cold water is continually passed. The crude product obtained in this way is purified by fractional distillation.

Tetrachlorethane is a colourless, heavy, refractive liquid with a boiling point of 147.2° C. It is a very essential constituent of solvent mixtures for cellulose acetate dope. It is stated to give to cellulose acetate a resilient quality that no other solvent gives. In fact, tetrachlorethane has in cellulose acetate much the same function as camphor in nitro-cellulose. Tetrachlorethane is also the starting point in the manufacture of other chlorinated hydrocarbons.

Dichlorethylene, $C_2H_2Cl_2$.—This is prepared by the suspending of tetrachlorethane in water, and submitting it to the action of zinc dust. Considerable heat is evolved, and dichlorethylene distills off at 55° C. This substance is used as a solvent for cellulose acetate in conjunction with alcohol and tetrachlorethane.

Trichlorethylene.—This compound is also prepared from tetrachlorethane by abstracting one molecule of hydrochloric acid thus :

$$CHCl_2.CHCl_2=CHCl : CCl_2+HCl$$

This is effected by treating tetrachlorethane with weak alkalis, or by passing the vapour of the same compound over surfaces of barium chloride or thorium oxide heated to 300°—390° C., when hydrochloric acid is split off.

Trichlorethylene has a boiling point of 88° C., and is a very efficient fat solvent. It has the advantage over tetrachlorethane of not attacking metal vessels. Trichlorethylene is also important as the starting point of a whole series of valuable organic products. By acting on trichlorethylene with caustic soda, lime, and alcohol there is formed dichlorvinyl ether :

$$C_2HCl_3+C_2H_5ONa=C_2HCl_2OC_2H_5+NaCl$$

This compound is wonderfully reactive. One very important property is its combination with water in the presence of a trace of HCl at ordinary temperatures to form chloracetic ester thus :

$$C_2HCl_2OC_2H_5+H_2O=C_2H_2ClOO_2H_5+HCl$$

Chloracetic ester is a compound which has been much used as a starting point for synthetic work. Chief among the products which can be synthesised in this way is indigo. The commercial manufacture of indigo, using acetylene as a starting point, is therefore possible.

Pentachlorethane and Hexachlorethane. — These compounds can also be prepared from tetrachlorethane by the acting on it with chlorine under the influence of actinic light. They are both used as constituents of solvent mixtures for cellulose acetate and cellulose nitrate.

Addition Products of Acetylene

Hydrogen.—If acetylene and hydrogen are led over reduced nickel at a reasonably low temperature, ethane and a little ethylene are formed. It is claimed that ethylene alone is formed (Ger. Pat. 253160) when the acetylene is reduced in the presence of platinum or palladium, together with iron, nickel, cobalt, silver, magnesium, zinc, cadmium, or aluminium.

Ethylene is the source of many important compounds. Through its chlorination product, ethylene glycol can be prepared. With concentrated sulphuric acid we can form ethyl sulphuric acid, which, on treating with water, gives alcohol. On the other hand, ethylene, when condensed with acetone, gives isoprene directly, which makes the synthesis of rubber possible by this means.

Nitrogen.—It has been stated that a mixture of nitrogen and acetylene, when exposed to an electric discharge or actinic light, forms hydrocyanic acid, according to the equation $C_2H_2+N_2=2HCN$.

This points out a method of nitrogen fixation hitherto untried on a large scale, although the cost of the acetylene may make the method too costly for commercial use.

Products formed at High Temperatures.—Although acetylene will not combine with water to form acetaldehyde below 100° C. in the absence of mercury salts, nevertheless, if the acetylene, mixed with steam, is passed through a tube heated to about 400° to 600° C. in the presence of appropriate catalysts, acetaldehyde is formed according to U.S.P. 1244901. In this particular case the catalyst recommended is molybdic acid on asbestos.

Under similar circumstances, in the presence of partly reduced bauxite, it is found—British Pat. 109983 (1916)—that acetylene can add on H_2S to form thiophene, or ammonia to form acetonitriles, picoline, and other pyridine bases. The study of reactions of this type should form a very fruitful field for future research.

The great drawback to work with acetylene at high temperatures is the tendency to form polymerisation products, which, together with any impurities in the gas, soon render the catalyst inactive, thus making it necessary to regenerate it quite frequently. At the same time it does not seem possible to obtain the products desired in any reasonable state of purity, a number of different substances being formed at the same time.

Acetylene Black and Hydrogen

If acetylene is detonated under high pressure by means of the electric spark, a complete decomposition of the acetylene into its elements occurs, according to the equation :

$$C_2H_2 = 2C + H_2.$$

This occurs at atmospheric pressure between 260° and 600° C. Many patents have been taken out covering this reaction. In a large number of cases provision is made for collecting the hydrogen produced. If oxides of carbon are introduced along with the acetylene, these are reduced with the formation of water, no free hydrogen being produced in this case.

Electrolytic Oxidation Products of Acetylene

If acetylene is submitted to electrolytic oxidation in acid solution, in the presence of mercury salts, acetic acid is produced directly, according to the equation :

$$C_2H_2 + H_2O = CH_3 . CHO$$
$$CH_3CHO + O = CH_3COOH.$$

This method for the manufacture of acetic acid, so far, does not appear to have been utilised commercially, and it is very doubtful whether it can compete with the present synthetic process.

If electrolysis of the acetylene is allowed to take place in alkaline solution, on the other hand, salts of formic acid are produced. There is a possibility of reducing this formic acid to formaldehyde by reduction with hydrogen over reduced nickel. However, this process is not practicable at the present time, on account of the low yield of formaldehyde obtainable.

Compounds of Aromatic Series

The polymerisation of acetylene to benzene by passage through a hot tube is a well-known reaction. However, as benzene can be produced much more cheaply as a by-

product in the coal distillation industry, this reaction is of no commercial significance.

Another possibility is the manufacture of phenol from acetylene by treating it with fuming sulphuric acid to obtain the sulphonic acid $(C_2H_2)_3(SO_4H)_4$. Phenol is obtained from the potassium salt of this acid by treating it with potash and distilling the product. So far, this process has not been utilised on a commercial scale.

Many of the reactions of acetylene have not been applied technically, and there is a very wide field in this direction for the utilisation of organic compounds which can only be manufactured at a high cost by other means. Even those processes for the utilisation of acetylene which have so far been patented are still mostly in an undeveloped state. It can therefore be seen that the future of acetylene, as the source of many important organic compounds, is particularly bright. In fact, acetylene should, in time, stand in the same technical relation to compounds of the aliphatic series as benzene at the present time stands in relation to compounds of the aromatic series. Looking further into the future, it can be seen that calcium carbide will come to be of ever-increasing importance to the chemical industry. As the population of the earth increases the forests are bound to become more and more valuable, and all available farming land will be given over to the production of foodstuffs for human consumption. The present economic scale of values will then be entirely altered, and many of the above processes, which are valueless to-day, will then be in commercial use.

Potash Recovery at Cement Plants

By Alfred W. G. Wilson, Ph.D.

The investigations on which this article is based were carried out by the author in the United States on behalf of the Canadian War Trade Board. At present fifteen cement plants in the United States have installed or are installing potash recovery equipment. In those plants where the equipment was installed two years or more ago the principal source of revenue during the last year of the war was potash recovery. Several plants paid for their entire installation within the first year of operation, and many appear confident of their ability to continue under normal conditions. The Canada Cement Co. announce that they are preparing plans for a potash recovery plant at their Port Colborne (Ontario) plant. This will be the first installation of its kind in Canada.

It has long been known that small quantities of silicates of the alkaline metals were present in the raw mixture used for the manufacture of Portland cement. The first reference to the occurrence of soluble material containing alkalies in the dust of a cement plant which has come to the writer's attention was by Seger and Cramer in 1904 (*Thonind.-Zeit.*, 1904, vol. 28, p. 531). They found that dust from a cement works consisted of 43.65 per cent. of insoluble and 56.35 per cent. of soluble material. The soluble portion was found to consist of 61.1 per cent. potassium sulphate and 3.89 per cent. potassium carbonate. The possibility of recovering potash as a by-product in the Portland cement industry was first pointed out by Dr. Clifford Richardson at a meeting of the American Society for Testing Materials at Atlantic City in June, 1904. At that time Dr. Richardson calculated that in a cement plant turning out 4,000 barrels of cement per day there would be a possible profit in the recovery of potash of between £20 and £40 per day. At the meeting of the Association of American Portland Cement Manufacturers in the same year R. H. Meade called attention to the fact that, approximately, one-half of the potash in the raw materials was volatilised in the burning of cement, and that the crust which collects on the walls of the kiln stack contained a considerable percentage of potassium sulphate.

It does not appear that any attempts were made to recover the soluble potash from the stack dust or cement plants prior to the war. Standard practice consisted in returning this dust to the mix whenever it was collected. In the manufacture of Portland cement it is necessary to reduce both the raw materials and the finished clinker to a fine state of division by grinding. As a natural result, much dust escapes into the atmosphere in the vicinity of these plants, either from the mill buildings or through the stacks. In some localities this dust is found to be a nuisance. In certain areas in California where orange and lemon groves predominate it was claimed that escaping cement mill dust was injurious to the groves. In Southern California certain orange growers instituted suits against the cement plants, and eventually succeeded in having them enjoined by the courts to prevent the escape of dust, if their operations were to be continued. These plants are located near Riverside and near Colton. The California Portland Cement Co. at Colton attempted to eliminate the dust nuisance by installing large dust chambers into which the flue gases were led. The Riverside Portland Cement Co., at Riverside, interested themselves in the electrical precipitation methods, which were then being developed by Dr. F. G. Cottrell. The experiments have finally led to the great development that has taken place within the last few years in the art of dust collecting by electrical precipitation.

Soon after the installation, at Riverside, of the Cottrell system for collecting dust it was noticed that this dust carried a rather high percentage of potash salts. When the supplies of European potash were cut off by the war this dust became a saleable article. The amount of soluble potash present in the dust, as recovered, is not very large, and the desirability of producing soluble potash salts in a more concentrated form was quickly evident. Experiments were instituted by Huber and Reath at the Riverside plant, and they succeeded in developing a satisfactory process.

The first installation at an American cement plant, erected primarily for the purpose of recovering the potash salts, is that of the Security Cement & Lime Co. at Security, Md., not far from Hagerstown. This company installed the Cottrell system in 1916, and have since carried out a good many experiments. Their operations have been very successful, and much of the information that is available to cement manufacturers in America has been made public through the several articles published by their manager, Mr. John J. Porter. Much additional information has also been supplied through the Western Precipitation Co., of Los Angeles, which controls the patent rights of this system of precipitation. During the last two years there have been developed in the western States several systems for the recovery of the potash-bearing dust which use some form of water spray for cleaning the gases. These systems have been designed in the attempt to develop a process that will show a higher efficiency than that hitherto obtained by electrical precipitation alone, as applied to this purpose.

At the present time nineteen cement plants are known to have installed equipment for the purpose of preventing the escape of flue dust. Seventeen of these plants were erected,

or are in course of construction, for the purpose of recovering the potash in the dust. One of the remaining two disposes of its flue dust as a potash fertiliser to local trade during certain seasons of the year. The other installation is for dust collection only. In the United States there are nine electrical precipitation installations in cement plants. There is also one in Norway, one in Sweden, one in Spain, and one in Japan. There are six cement plants in the United States using five different systems of water spraying for the recovery of the flue dust.

The Chemistry of the Process

The raw materials used in the manufacture of Portland cement are, usually, some form of limestone (or marl) and clay, or shale. These materials are pulverised separately to a very fine state of division, and are mixed in the proper proportion as determined by experience. They are then submitted to a high temperature in a special type of kiln. Heat is supplied by the combustion of some form of fuel. In eastern America pulverised coal is almost invariably used. In certain of the western States natural petroleums are employed. In a few plants natural gas is utilised for burning. At a temperature of about 700° C. the carbonates in the limestone are decomposed, with liberation of carbon dioxide and the formation of lime. At temperatures of about 1,430° C. the lime sinters with the silica and alumina of the clay or shale to form cement clinker. The sintered clinker after cooling is finally comminuted in special pulverising machinery, and forms the cement of commerce.

The gases which pass through the stacks usually contain large or smaller quantities of the following products: water, in the form of steam derived from that present in the raw materials, or formed during the combustion of the fuels; carbon dioxide, liberated on the decomposition of the limestone, and formed during the complete combustion of the carbon element of the fuel; carbon monoxide, due to incomplete combustion; sulphur dioxide, formed from sulphur in the fuel, or liberated on the decomposition of gypsum present either in the raw mix or in the fuel; sulphur trioxide, formed from the dioxide by the catalytic action of dusts in the stack; nitrogen, derived from the air supplied for combustion; and occasionally a small excess of uncombined oxygen. The stack gases also contain the volatilised salts of a certain portion of the alkaline metals (sodium, potassium, and lithium) present in the original raw materials used, and considerable quantities of dust derived from the raw mix charged or from the fuel ash where coal is used.

In average practice it is found that about 608 lb. of dry raw mix are required to produce 1 barrel, or 380 lb., of cement. (In Canada 546 lb. of dry raw mix to produce 1 barrel, or 350 lb., of cement.) About 100 lb. of coal, having a heating value of 13,500 B.Th.U., are required to burn this material. Where petroleum is used as fuel, about 9.4 gallons, having a heating value of 18,800 B.Th.U. per pound, are required.

There are two principal methods of cement manufacture, usually termed the dry process and the wet process. As the name indicates, in the dry process the raw mix is fed direct to the kilns in a dry state as it comes from the pulverisers. In the wet process the raw mix is ground with water to form a slurry. Slurry as fed to the kilns contains from 38 to about 45 per cent. of water, which must first be evaporated before the burning process can begin. It is obvious that, owing to the presence of this large quantity of water, the temperature of the escaping flue gases, where the wet process is in use, will be lower than in the dry process.

The temperatures of the stack gases as they leave the kilns are usually about 800° C. in the dry process, and 150° C. in the wet. The maximum temperature in the zone of greatest heat is about 1,430° C., occasionally slightly higher. The temperature of the clinker at the point of discharge is usually about 700° C.

As regards the by-products which are available in cement mill practice, approximately 13 per cent. of the total heat generated is carried out of the kiln with the clinker. Occasionally a portion of this heat is used for pre-heating the air supply. About 45 per cent. of the heat is carried out of the kiln by the dust-laden flue gases, and approximately 10 per cent., or higher, is lost by radiation. In ordinary practice about 480 lb. of carbon dioxide per barrel of cement escape with the flue gases, slightly less than one-half of this being derived from the limestone in the cement mix. The quantity of potassium salts carried out with the flue dust and gases varies in ordinary practice from 2 to about 7 lb. per barrel of cement. Sodium and lithium oxides, liberated in association with potassium oxide and volatile salts of these metals, are also found in the flue dust and gases.

The salts of the alkaline metals which are found in the flue gases and dust are derived from alkaline silicates present in the raw materials used in the cement manufacture. The greater portion of these is usually found in the clay or shale used in making the raw mix. Small amounts may be derived from the limestone, or from the ash of the coal used for fuel.

Analysis of the raw mix from Canadian plants shows a variation in potash content between 0.50 and 1.04 per cent. In the process of burning, the potash-carrying silicates are decomposed at the high temperatures, probably owing to reactions with the lime. There are present in the kiln gases carbon dioxide, sulphur dioxide, and possibly other compounds. Consequently the formation of a number of different alkaline salts is possible. The potassium salt which occurs in the largest amount is the sulphate. The thiosulphate, the sulphide, and the carbonate also occur. Under certain conditions the odour of sulphuretted hydrogen can be noted in the escaping gases, and the elemental sulphur has been found on the walls of some of the treaters. The corresponding salts of sodium and lithium probably also occur.

Where petroleum is used as fuel it has been found that a greater proportion of the potassium salts in the recovered dust is soluble than where the fuel used was coal. Further investigation showed that it was probable that in the latter case the silica from the ashes of the coal combined with the alkaline salts to form a silicate (which was insoluble in cold water), but which was slowly soluble in hot water or in weak acid solution.

Cement Mill Dust Recovery

The methods employed for the recovery of the potash constituents volatilised in the process of cement manufacture all depend upon the fact that these constituents are carried into and through the stack with the escaping flue gases. The problem, therefore, became one of cleaning these gases, recovering the solid products, and separating the potash salts from the less desirable residues. Two general methods have been developed, the one for cleaning the dry gases, the other in which the gases are cleaned by a system of water sprays. During the course of development of the electrical precipitating process it was found that a large proportion of the volatilised potash salts were in such a condition that they were not easily removed from the gases. The development of the water-spray systems on the one hand, and of the electrical water film treater on the other, marks further steps in the progress that has been made in attempts to increase the efficiency of potash collection methods.

Dry Cleaning Methods

Two types of equipment are in use: one, the expansion chamber, which is supplemented by a series of auxiliary chambers in which water sprays are located; and the other, electrical precipitation by the Cottrell system. This latter method may be further sub-divided on the basis of the type of treater used.

(*a*) Expansion Chamber System.

The expansion chamber system was first introduced by Mr. T. J. Fleming at the plant of the California Portland Cement

Co., near Colton. The following description of the dust-collecting system is based on an article published by W. C. Hanna. This installation consists of two very large rectangular chambers, connected with the cement kiln stacks by long flues. Exhaust fans are used at the ends of the flues close to the expansion chamber. The draught for the kilns and driers is maintained by the suction of these fans. The fans discharge into the large dry settling chambers immediately adjacent. The area of the cross-section of these chambers is so large, in comparison with the area of the cross-section of the flues, that the velocity of the gases, and consequently their carrying power, is very greatly reduced. All the coarse dust and some of the fine dust settles. Incidentally, this dust is collected in a series of receptacles which deliver directly to screw conveyors, that collect the dust from different parts of the chamber and deliver it to a central common conveyor, which in turn carries it to the dust-treating plant, or back to the cement mill. Beyond the dry dust settling chamber is another chamber which is sub-divided by apron walls in such a way that all the escaping gases pass upwards and downwards seven times before reaching the outer air. During each of these seven passes they are subjected to the action of a fine water spray, which effectively removes the finer material that did not settle in the dry chamber. The liquors from these spray chambers are passed through a series of conical settlers to remove the dust, the liquor being returned to circulation, or filtered and treated for the recovery of its potash content when it reaches the desired strength.

(*b*) Electrical Precipitation.

The principles applied for the removal of solid particles from flue gases in the Cottrell system of electrical precipitation have been very frequently discussed since its first introduction in 1910. The more important references to the subject are listed in the bibliography at the end of this bulletin. References are also given to descriptions of a number of installations, hence it is not necessary to discuss the subject here.

In the application of the Cottrell system to the precipitation of cement mill flue dust two principal types of electrical treaters have been developed. In the one, the operations are carried on so that the dust is recovered in a dry state. In the second type, the dust is recovered as a sludge, and the soluble portion has for the most part gone into solution in the water.

With respect to those treaters in which the dust is recovered dry there are two kinds, usually termed the "plate" treater and the "pipe" treater. An electrical treater of the plate type was the first developed for use in the cement business, and the Riverside plant is the only one in which they have been installed. There are eight installations in America, two in Scandinavia, one in Spain, and one in Japan using the pipe type of treater.

In the plate type of treater a number of specially constructed collecting electrodes are arranged parallel, in a vertical position, and spaced at equal intervals, the whole being housed within a suitably constructed chamber. In the treater at Riverside each plate consists of an angle-iron frame, on which a heavy metal screening has been stretched. Between each pair of electrodes is suspended a series of parallel vertical wires, suitably spaced, which act as discharge electrodes. The frame to which these wires is attached is insulated from the rest of the treater, and is connected with the negative terminal of the rectifier. The plates of the treater and the positive terminal of the rectifier are both grounded. The treater housing is so constructed that the effluent gases from the flues pass between the plates of the treater in a horizontal direction.

A single unit of the pipe type of treater consists of a vertical pipe made of sheet steel, usually about 12 inches diameter and 18 feet long. The high-tension discharge electrode consists of a single wire, suspended vertically along the axial line of the pipe. The walls of the pipe act as the collecting electrode. The number of pipes in a treater unit vary according to circumstances from 80 to 240.

In operation the gases to be cleaned enter the treater at the top, pass downward through the several pipes which constitute the unit, and are discharged into a common flue below. Occasionally the path of the gases is reversed, being from bottom to top, instead of top to bottom. A special hopper bottom is provided below the treater unit, to receive the dust. This hopper usually discharges from below, either continuously to a conveyor, or intermittently to cars, barrows, or a stacking plant.

When in operation the greater portion of the dust is deposited on the surface of the collecting electrodes. At stated intervals the stream of gases is interrupted, the gases being diverted to another treater, and the accumulated dust is shaken from the sides of the collecting electrodes, vibrations being generated by striking the pipes with suitably suspended knockers. The discharge electrodes are also shaken, to free them from any dust which may have collected upon them.

In practice a battery of two or more unit treaters is generally employed in order that there may be no interruption in the current of gases discharged through the flues, though it is diverted from each treater in turn for the purpose of removing the accumulations of dust.

(*To be continued.*)

Review

Kelly's Directory of the Chemical Industries, &c., 1919. Kelly's Directories, Ltd., 182-4, High Holborn, London, pp. xxxi, 844, 258.

The new edition of this useful work has an interesting modification of title. It now appears under the style of the Directory of the Chemical Industries of the United Kingdom, whereas the thirteen previous editions were published (at intervals of about four years) under that of the Directory of Chemists and Druggists, including manufacturing chemists, &c. As a sign of the increasing recognition of chemical "industry," the change is worth noting. The Directory is prepared with the care and knowledge which come of long specialisation in this class of publication, but the classification under towns or under branches of the industry still leaves the person who has only the name of a firm to guide him stranded. If it were possible to have one complete alphabetical list of firms the Directory would be complete, but this would entail the disadvantages of, perhaps, double the bulk and double the price, and in the circumstances we must be thankful for a Directory that helps as far as this one does.

The present edition is considerably larger than the previous one, which appeared in 1916, owing to the rearrangement of certain portions of the sections dealing with the classified lists of trades. In the present lists of chemical manufacturers (which, with the sub-headings, in the London section, cover twenty pages and in the general list for the remainder of England, Scotland and Wales occupy over forty pages), the information given is of a comprehensive character. The sub-headings in the general list alone include, amongst others, lists of the manufacturers of:—Alkaloids, alum products, ammonia products (60 in number), antimony and arsenic products, coal tar products (140), cyanides, disinfectants, dyers' chemicals (30), dyes and colours (120), glues and sizes, iron salts (59), magnesium and magnesium compounds, manganese compounds, naphtha (43), sheep dips (70), synthetic chemicals (32), and zinc and zinc compounds (28). Some of the sub-headings necessarily contain but very few names, as, for instance:—Anæsthetics (8), bismuth and bismuth salts (4), chrome and chrome compounds (10), cobalt and cobalt compounds (5), lithium salts (3), radium products (2), rubidium (2), thorium salts (3), and uranium salts (3). The publishers have obviously done their best to make the contents of the Directory not only full, but also accurate, and the information has generally been brought up to as late a date as possible.

Annual Board of Trade Returns (II)

Chemical Exports for the past five Years

In our last issue we published the quantities and value of imports of chemicals, drugs, dyes, colours, etc., for the years 1914–1918, taken from the Annual Board of Trade Returns. We give below the quantities and values of exports of chemical articles, the produce and manufactures of the United Kingdom.

EXPORTS OF ARTICLES, THE PRODUCE AND MANUFACTURES OF THE UNITED KINGDOM.

ARTICLES.	QUANTITIES.					VALUE.				
	1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
						£	£	£	£	£
Chemicals and Chemical Preparations, other than Manures and Medicines :—										
Aluminous Sulphates (including Alum) .. .. *Cwts.*	316,546	414,626	376,997	301,600	282,770	84,334	130,374	199,863	205,242	195,378
Arsenic and its Oxides .. .. ,,	12,176	12,357	14,441	6,569	6,210	9,663	13,509	29,973	26,781	42,036
Bleaching Powder .. .. ,,	599,300	491,254	173,092	58,420	71,331	158,775	180,931	142,658	39,175	61,707
Carbide of Calcium .. .. ,,	2,646	5,375	6,535	1,665	1,650	2,454	4,805	7,485	2,386	3,389
Carbonate of Ammonia .. .. ,,	56,415	53,637	78,966	35,190	16,307	96,739	109,373	223,899	172,975	58,967
Coal Products, not Dyes :—										
Aniline Oil and Toluidine .. *Lbs.*	1,981,444	2,872,952	2,177,492	2,474,087	3,394,027	54,916	108,752	191,746	150,595	212,872
Anthracene .. .. .. ,,	633,407	787,950	2,813,700	2,113,649	2,240	1,271	1,808	8,144	8,136	40
Benzol and Toluol .. ..*Gallons*	4,163,773	7,334,436	12,136,409	11,989,363	9,877,518	195,503	430,853	805,650	962,804	723,684
Carbolic Acid .. .. .. *Cwts.*	130,412	144,560	114,439	123,301	121,381	135,303	250,519	201,098	406,574	397,691
Coal Tar, Crude	48,011	22,619	12,032	2,968	512	9,650	3,977	2,295	635	101
,, Refined and Varnish*Gallons*	2,677,453	2,538,676	3,440,023	3,029,021	934,877	57,217	55,479	85,813	71,730	28,699
Naphtha .. .. .. ,,	391,409	412,328	536,583	425,642	161,469	17,432	24,457	52,558	39,992	22,076
Naphthalene .. .. .. *Cwts.*	60,903	70,977	125,928	215,656	206,517	23,889	46,347	167,179	238,150	304,076
Pitch .. .. ,,	7,246,977	5,288,865	5,362,324	6,527,268	8,049,259	711,105	341,646	292,639	432,395	884,367
Tar Oil, Creosote, &c. ..*Gallons*	31,146,740	35,233,624	33,463,040	12,310,745	1,900,395	523,799	652,382	585,592	401,050	74,708
Other Sorts .. .. .. *Cwts.*	602,576	467,324	505,487	382,450	169,967	298,481	301,948	388,205	398,515	234,782
Copper, Sulphate of .. .. *Tons*	67,898	65,211	38,919	47,130	47,596	1,423,018	1,625,037	1,700,615	2,703,899	3,023,978
Cyanide of Potassium or Sodium *Cwts.*	160,533	224,556	244,083	235,432	214,166	687,417	1,065,530	1,187,222	1,313,602	1,276,434
Disinfectants, Insecticides, Weed Killers, and Sheep and Cattle dressings (except Tobacco Offal) .. .. ,,	363,482	370,394	444,575	331,369	343,746	463,550	512,121	688,863	605,673	871,032
Dye Stuffs :										
Products of Coal Tar	46,031	36,683	58,616	74,190	83,912	170,013	269,419	677,551	1,132,099	1,251,659
Other Sorts .. .. .. ,,	175,827	172,012	122,815	62,593	20,695	125,433	231,432	420,454	279,748	144,537
Glycerine, Crude .. .. .. ,,	50,701	136,845	48,687	32,913	17,344	153,369	423,526	153,565	109,066	61,886
,, Distilled .. .. .. ,,	81,620	87,600	71,945	65,612	43,784	334,412	377,942	320,999	298,926	220,419
Hydrochloric Acid .. .. .. ,,	4,230	8,497	4,048	3,112	1,308	3,583	5,875	5,477	5,239	2,961
Muriate of Ammonia .. .. ,,	91,242	84,967	82,256	84,524	44,206	117,429	122,382	153,040	188,179	124,162
Potash Compounds :										
Saltpetre (Nitrate of Potash), British prepared .. .. ,,	20,281	19,441	18,903	9,935	16,456	30,048	43,593	48,686	30,636	53,286
Chromate and Bi-chromate of Potash .. .. .. ,,	35,717	8,693	4,723	7,778	4,334	52,762	26,396	33,638	63,256	48,109
Other Sorts .. .. .. *Value*	—	—	—	—	—	114,986	133,571	84,342	54,393	32,923
Soda Compounds :										
Soho Ash .. .. .. *Cwts.*	3,575,260	4,362,012	3,138,151	3,205,442	3,378,148	643,449	804,402	847,673	972,286	1,100,655
,, Bicarbonate .. .. ,,	509,197	555,910	661,605	499,620	438,848	127,500	145,136	216,161	174,636	207,433
,, Caustic .. .. .. ,,	1,488,052	1,116,698	583,820	451,507	641,129	701,894	614,659	614,190	631,305	1,012,158
,, Chromates and Bi-chromates .. .. .. ,,	47,975	91,396	85,577	97,530	81,693	59,944	134,797	279,747	299,712	265,870
,, Crystals .. .. .. ,,	232,032	301,013	224,556	82,103	13,968	39,536	51,786	56,412	26,087	6,220
,, Sulphate (Saltcake) .. ,,	791,991	628,261	483,447	414,726	591,427	70,902	57,742	46,793	59,474	101,030
,, Other Sorts .. .. ,,	540,685	523,048	556,200	559,266	606,734	174,942	215,695	333,883	468,454	783,536
Total of Soda Compounds.. .. ,,	7,185,192	7,578,338	5,733,356	5,310,194	5,751,947	1,818,167	2,024,217	2,394,859	2,631,954	3,476,902
Sulphuric Acid .. .. .. ,,	95,263	36,360	10,372	20,647	22,731	39,069	20,804	9,472	25,996	31,803
Tartaric Acid .. .. .. ,,	9,654	16,279	20,991	17,434	3,015	56,846	132,695	295,739	254,192	50,015
Unenumerated .. .. .. *Value*	—	—	—	—	—	1,385,522	1,840,559	2,673,077	2,899,177	3,374,034
Fuel, Manufactured .. .. *Tons*	1,607,757	1,225,071	1,324,695	1,526,272	1,505,090	1,394,211	1,258,891	1,780,122	2,273,642	2,420,685
Carbons .. ..*Number*	1,839,433	1,165,392	1,056,134	854,741	594,060	7,707	8,432	10,409	22,939	8,178
Glass :—										
Plate .. .. *Cwts.*	206,813	140,771	119,810	100,828	75,229	355,227	287,094	298,026	299,639	269,993
Flint, Plain, Cut, or Ornamented and Manufactures of Flint Glass (except Bottles) .. ,,	67,790	52,532	53,302	46,219	32,368	258,060	223,884	273,104	260,304	241,656
Bottles .. .. *Gross*	834,742	657,485	623,940	405,188	306,255	521,640	423,717	441,551	346,876	325,846
Manufactures, Unenumerated .. *Cwts.*	478,050	249,540	202,142	192,966	122,409	415,861	309,103	290,969	279,160	214,800
Glue, Size, and Gelatine .. .. ,,	254,230	138,200	111,801	111,089	18,209	299,281	250,828	338,531	487,627	158,567
Grease, and Unrefined Tallow and Animal Fat .. .. .. ,,	677,633	615,470	438,383	725,433	87,484	837,647	799,932	823,242	1,874,272	275,656
Gums, British prepared .. .. ,,	43,493	41,551	35,949	25,132	14,193	87,888	81,774	97,636	66,950	35,695
Manures :—										
Basic Slag .. .. .. *Tons*	132,269	117,347	38,628	1,825	1,065	211,075	199,572	104,059	6,561	3,638
Sulphate of Ammonia .. .. ,,	313,341	293,853	259,290	62,931	19,150	3,767,553	3,970,548	4,354,295	1,188,412	480,744
Superphosphates.. .. .. ,,	66,051	68,679	14,368	3,204	2,547	175,449	224,117	74,053	20,120	16,421
Unenumerated .. .. .. ,,	127,454	60,782	50,499	27,389	37,327	732,397	411,931	419,645	286,100	420,216
Medicines, comprising Drugs and Medicinal Preparations :—										
Cocaine and Cocaine Salts .. *Ozs.*	4,096	17,647	7,647	1,250	2,037	1,447	5,719	5,622	2,019	4,530
Morphia and Morphia Salts .. ,,	504,020	295,572	225,611	124,593	136,827	208,717	200,734	154,544	114,193	170,216
Opium, dried and powdered in the United Kingdom .. *Lbs.*	19,696	7,630	33,010	21,741	82,499	28,886	11,767	59,370	65,489	311,238
Quinine and Quinine Salts .. *Ozs.*	1,477,703	2,412,969	1,659,030	736,525	406,207	91,415	221,218	225,763	118,516	68,267
Unenumerated .. .. .. *Value*	—	—	—	—	—	1,968,720	2,637,467	3,909,452	2,856,259	2,562,711

EXPORTS OF ARTICLES, THE PRODUCE AND MANUFACTURE OF THE UNITED KINGDOM—*continued.*

ARTICLES.		QUANTITIES.					VALUE.				
		1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
							£	£	£	£	£
Metals and Ores and Manufactures thereof :—											
Antimony :—											
Ore	*Tons*	39	23	—	51	—	588	1,974	—	5,143	24
Crude and Regulus	,,	4,286	4,895	5,758	1,713	1,475	132,968	455,387	582,890	156,507	127,913
Brass and Manufactures thereof, not being Ordnance :—											
Wire	*Tons*	438	351	147	46	159	46,430	42,790	32,691	13,632	30,531
Other Sorts	,,	10,013	10,735	11,551	4,938	3,721	1,146,717	1,051,909	1,455,166	914,761	706,009
Copper Ore	,,	313	—	1	—	—	579	—	66	—	—
Copper :—											
Regulas, Matte, Precipitate and Residues	,,	1,553	1,220	1,472	1,101	516	29,984	30,180	40,702	26,340	12,085
Unwrought, in Ingots, Cakes or Slabs	,,	7,249	6,657	9,189	5,177	4,034	510,529	514,905	1,134,165	725,426	533,818
Wrought or Manufactured (including Copper Plates engraved :)—											
Mixed or Yellow Metal	,,	13,202	3,809	1,614	464	223	857,576	305,697	219,012	69,716	34,106
Other kinds	,,	18,088	13,860	8,014	3,417	2,485	1,566,406	1,270,310	1,079,043	594,686	425,273
Iron Ore :—											
Manganiferous	,,	1,506	5	10	25	—	10,975	20	33	192	—
Other Sorts	,,	12,023	1,664	1,090	642	160	13,717	5,752	3,632	1,847	464
Iron or Steel, Old (except old Rails)	,,	88,195	51,063	61,715	16,771	10,895	273,504	191,098	207,114	109,829	85,430
Iron and Steel, and Manufactures thereof :—											
Iron :—											
Pig Iron :											
Basic	,,	6,318	1,770	13,536	10,570	12,234	17,114	7,327	61,817	57,806	77,410
Forge and Foundry	,,	489,997	338,726	435,772	326,994	242,437	1,347,457	1,220,582	2,162,949	1,900,803	1,475,580
Hæmatite	,,	172,660	167,793	340,098	301,717	162,136	608,992	877,998	2,436,450	2,220,870	1,186,916
Spiegeleisen, Ferro-manganese and Ferro-silicon	,,	111,788	102,938	127,401	94,477	65,354	950,177	1,366,455	2,772,284	2,592,271	2,183,888
Lead Ore	,,	3,715	86	152	210	18	36,679	1,598	5,130	3,973	709
Lead :—											
Pig	,,	21,655	24,936	12,960	2,326	59	410,301	554,244	384,380	74,369	1,947
Manufactures	,,	14,192	15,457	15,450	7,038	4,859	353,504	430,008	594,994	313,640	227,949
Tin, Unwrought	,,	13,399	14,167	18,022	19,265	15,238	2,061,024	2,318,750	3,254,124	4,224,504	4,959,651
Zinc Ore	,,	7,974	400	334	—	—	27,980	3,600	2,410	—	—
Zinc or Spelter :—											
Crude, in Cakes	,,	6,027	767	2,141	6,608	876	123,664	34,481	192,120	399,948	50,789
Manufactures	,,	1,447	1,628	1,427	1,196	508	50,666	111,118	150,360	94,884	41,387
Ores, unenumerated	,,	4,988	327	874	380	37	43,919	14,680	12,103	11,848	9,538
Metals and Manufactures thereof, Unenumerated :—											
Printing Type	,,	357	197	197	96	96	60,878	35,661	37,074	23,175	26,670
Other Sorts	,,	19,276	13,830	14,738	9,240	4,196	2,034,365	1,963,485	2,754,485	2,074,991	1,281,483
Methylic Alcohol (not purified so as to be potable)	*Gallons*	182,477	155,008	118,232	17,336	5,804	22,453	21,984	22,873	4,345	4,804
Oils, except Medicinal :—											
Coco-nut, Unrefined	*Cwts.*	50,837	38,814	13,529	15,607	10,620	105,709	78,783	29,539	50,961	38,349
,, Refined	,,	56,260	100,599	39,293	10,435	17	147,631	266,773	125,140	39,832	100
Olive, Unrefined	*Tuns*	12	9	5	—	—	626	625	444	—	—
,, Refined	,,	228	185	209	99	1	36,552	32,158	33,932	16,751	427
Palm and Palm Kernel, Unrefined	*Cwts.*	63,685	162,872	60,799	—	—	138,331	334,919	136,458	—	—
,, Refined	,,	20,153	47,858	30,232	—	—	39,264	103,190	58,224	—	—
Palm*, Unrefined	,,	—	—	—	25,225	5,564	—	—	—	60,414	10,030
,, Refined	,,	—	—	—	25,114	1,000	—	—	—	53,512	2,800
Palm Kernel*, Unrefined	,,	—	—	—	423,958	130,023	—	—	—	1,015,621	322,191
,, Refined	,,	—	—	—	94,851	26,290	—	—	—	235,125	58,658
Seed :—											
Castor	*Tons*	7,715	3,064	3,084	4,342	5,635	202,025	109,101	175,321	354,930	527,583
Cotton-seed Oil, Unrefined	,,	438	4,702	171	1,521	—	13,198	127,208	6,327	81,290	—
,, ,, Refined	,,	27,062	21,505	2,407	652	51	864,037	677,909	101,197	38,961	2,989
Linseed Oil, Pure	,,	22,513	53,962	23,351	16,791	819	639,986	1,673,876	971,806	912,309	51,719
,, Not Pure	,,	1,832	1,905	1,443	2,217	934	48,389	55,109	56,115	124,769	56,838
Rape Seed Oil	,,	6,830	6,050	3,940	14,721	3,232	206,192	218,022	180,327	922,163	219,380
Soya Bean Oil	,,	9,321	13,473	4,554	608	—	305,059	430,387	182,415	37,435	—
Other Seed Oil	,,	3,160	3,062	1,620	7,176	5,004	89,853	105,908	70,476	454,784	342,779
Essential	*Lbs.*	403,824	457,163	536,482	527,100	447,373	116,316	140,537	177,109	204,424	271,300
Unenumerated	*Value*	—	—	—	—	—	1,159,581	1,224,609	1,671,994	1,862,713	751,077
Oil-Seed Cake, not sweetened :—											
Cotton-seed Cake	*Tons*	4,430	3,105	11	17	23	17,265	19,609	142	284	444
Linseed Cake	,,	4,184	103	61	43	35	31,981	1,063	804	834	825
Rape-seed Cake	,,	400	299	2	—	—	2,205	2,070	38	5	—
Soya Bean Cake	,,	8,845	18,566	3,830	1	—	61,322	156,227	36,132	20	—
Unenumerated	,,	23,707	8,024	1,648	24	12	153,054	56,896	13,149	398	251
Oleo-margarine and Refined Tallow and Animal Fat	*Cwts.*	181,191	155,120	74,659	14,579	2,489	368,499	390,969	223,076	50,002	10,004

* Included in "Oils : Palm and Palm Kernel" prior to 1917.

EXPORTS OF ARTICLES, THE PRODUCE AND MANUFACTURE OF THE UNITED KINGDOM—*continued.*

ARTICLES.		QUANTITIES.					VALUE.				
		1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
	Cwts.						£	£	£	£	£
Painters' Colours and Materials :—											
Barytes	,,	59,587	49,079	84,522	75,120	31,369	11,209	12,708	30,207	33,748	16,658
White Lead	,,	384,982	310,412	262,250	104,708	23,964	534,770	480,652	569,319	259,821	64,359
Zinc Oxide	,,	38,733	44,792	54,480	19,859	3,258	44,970	83,363	151,916	59,205	11,997
Unenumerated	,,	1,635,561	1,274,455	1,515,413	940,864	428,636	2,375,298	2,096,509	3,274,446	2,459,128	1,243,440
Soap :—											
Soft Soap	,,	31,183	97,201	60,261	81,236	29,356	25,765	98,037	90,416	135,939	70,216
Household and Laundry Soap in bars or tablets	,,	1,583,629	1,687,033	1,952,006	2,324,934	1,291,095	1,696,383	1,905,008	2,670,616	4,057,129	3,299,179
Polishing and Scouring Soap	,,	6,621	6,631	8,780	7,904	5,245	9,784	10,476	14,743	14,429	12,404
Soap Powder	,,	29,689	22,839	26,452	20,778	10,795	31,527	24,863	30,619	28,530	19,174
Toilet Soap	,,	79,735	92,207	120,989	98,176	72,031	414,039	457,912	641,961	621,353	647,141
Unenumerated (including Cotton-seed Oil Soap)	,,	4,343	5,179	4,250	3,457	4,424	8,776	10,651	10,253	10,975	16,902
Sugar, and all articles partly composed of Sugar :—											
Sugar, Refined and Candy		299,936	98,719	89,507	21,806	16,088	234,722	147,887	140,281	44,577	35,548
Molasses, and all Sugar and Extracts from Sugar, which cannot be completely tested by the Polariscope	,,	461,751	234,586	145,882	10,886	3,096	276,653	184,236	159,517	15,248	7,005
Glucose :—											
Solid	,,	1,641	1,095	28,434	1,992	596	1,358	947	32,463	2,950	1,644
Liquid	,,	4,681	15,123	37,722	6,261	59	3,053	12,852	42,380	7,680	184
Saccharin, and Mixtures containing Saccharin or other stances of like nature or use	*Ozs.*	150,065	4,664	15,458	485	223	3,726	682	3,257	338	103

Chemical Engineering Group

Notes on Recent Progress and Prospective Developments

SINCE the very successful first conference of the Chemical Engineering Group, held in July last in London, on the occasion of the annual general meeting of the Society of Chemical Industry, we understand that the Group Committee has devoted its energies partly to perfecting its organisation and partly to preparation for subsequent conferences, to be held during the next twelve months. The subject of the second conference, arranged for later in the present year, is "The Transport and Distribution of Liquids in Chemical Works," and in connection with this an exhibition of plant and appliances suitable for such purposes is to be organised.

In the spring of next year, the Group hopes to arrange a conference on "Labour-Saving Appliances in Chemical Works," and a number of highly important contributions to this conference have been promised by prominent American chemical engineers, who are members of the Group. America has always been characterised by the most complete practical elimination of unskilled manual labour from its industrial processes, and such papers as are expected from American sources will be instructive and suggestive to the English chemical manufacturer, who is prone to unprofitable conservatism in this matter.

Later next year, probably on the occasion of the next annual general meeting of the Society of Chemical Industry, a most important conference on "Filtration" is to be arranged, to be followed some months afterwards by one on "Heat Transmission." For both these conferences, papers from well-known English and American engineers and chemical engineers are promised, and it is the Group's intention to make the proceedings of such meetings up-to-date and authoritative, epitomising the latest theory and illustrating the most modern practice in the subjects treated. Arrangements for subsequent conferences are in hand, the committee's aim being to have its programme settled as far as practicable at least two years in advance.

In addition to organising conferences of the nature of those just mentioned, the Group is arranging for single papers from its members on chemical engineering subjects, to be read in the main before local sections of the Society of Chemical Industry. One such, for example, is to be given on November 13 next before the Bristol Section of the Society, on "Sulphur and Pyrites Burners," and a number of speakers, chiefly from London, will contribute short accounts of aspects and experience of the subject with which they have special acquaintance. Other papers, dealing, for example, with "Oil Extraction and Refining," "Low Temperature Carbonisation," "Power Production," and so on, are in hand, and will be read as opportunity offers.

The Group is actively developing the preparation of data sheets and curves useful in chemical engineering design, and already has in print the first series of these. The training of chemical engineers is also receiving attention, and steps are being taken to call the attention of our university authorities to the need for chemical engineering education in the United Kingdom. In this connection it is significant to note that over sixty of the educational institutions of university rank in the United States have organised courses in chemical engineering, extending in all cases over a term of years, some having been instituted nearly thirty years ago. The number of such courses in English universities can be counted on the fingers of one hand. Moreover, many of the American universities include as an essential of their chemical engineering curriculum, definite instruction in business training, knowledge which is equally vital to the success of industrial enterprise.

The above gives but a brief account of the many present activities of the Chemical Engineering Group, and a great deal could be said of the schemes it has for development when action is possible. The Group has recently taken new offices at 24, Buckingham Street, Strand, London, W.C. 2, and a paid assistant secretary has been appointed to devote his whole time to the ever-growing volume of work. The Group Committee is anxious to extend the influence of the Group as quickly and as far as possible, and looks to its members to give all the assistance in their power. An informal meeting is being arranged in London for October 23 next, at which the work of the Group will be discussed, and the Committee hopes to derive much benefit from the opportunity thus afforded of exchanging ideas with other members of the Group. The final object of the Group is the broad one of aiding national progress, and it merits the assistance and support of all engaged in chemical and metallurgical industry in the achievement of its aims.

Some Thoughts about the Strike

By E. J. P. Benn.

(Chairman of the Industrial Reconstruction Council)

WHETHER the blame for the strike will ultimately lie with the railway leaders or with Ministers is still to be discovered. The strike is, first and foremost, a strike against official higgling and departmental methods generally. For six weary months the men's executive has been humbugged by Whitehall, and the sudden decision to take the plunge on Friday night was directly traceable to exasperation at those methods.

Had the railwaymen come out next February with the same case, with the points of the case the same as they are to-day, the whole country would have been with them. Coming out as they did, six months before their grievances can possibly become operative, the country is solid against them. The cause, so far as it is understood to date, is good. The methods are intolerable, and on this account every good citizen is driven into irreconcilable hostility to the N.U.R.

Opinion on industrial questions may be roughly divided into two groups. There are those who hope and pray for an ordered progress, which will result in a steady uplifting of the rank and file of labour, and the creation of an ever-increasing confidence between all the parties to industry. There are also those who may be described as industrial militarists, who, whether they confess it or not, really believe that the interests of capital and labour are opposed to each other, a creed which they sum up in the expressive phrase, "The fight must come, and better get it over." The railway strike is a triumph for the latter party. It comprises both advanced Socialists and reactionary employers. These persons, whose views are as wide apart as the poles, have played each other's game in the last week, and they, and they alone, are to be thanked for the present state of affairs.

The pity of it is that by this shocking blunder labour is going to lose much of the progress it has made during the last few years. The war has brought about a great uplifting of the position of the working classes, and this strike is going to undo that work. Whatever may be the nominal result of the strike, it is a blunder from the labour point of view; indeed, if the impossible were to happen, if Mr. Thomas were to win in the present dispute, it would be the most expensive win that any leader ever secured. The uplifting of labour has not been a matter of money or wages or other material things. It has been an uplifting in public esteem and public sympathy. The Whitleyites were gradually absorbing the nation. Men and women of every class were coming to look upon labour as partners in industry; public opinion was ready for the next big step, and now all that work has been undone.

The Prime Minister is as much responsible as anybody. After five years of destruction in a period of unprecedented shortage, he has used language which is very naturally interpreted by working men as meaning more of this world's goods for themselves. The facts are that everybody must, for a time, be contented with less of this world's goods. That is a proposition so simple as to need no apology for its statement. Yet politicians have, by beating profiteering and similar silly drums, deliberately fostered the opinion that there was plenty of everything and that the working man was being robbed of his share. In such a case is it any wonder that the workman gets suspicious when he finds that Cabinet Ministers are preparing to reduce his money?

From the point of view of those with whom the Whitley movement is peculiarly associated, the whole thing is the subject of the keenest disappointment. Some little satisfaction may be found in the fact that the Whitley movement has so far not touched the railway and transport world. The Triple Alliance, it will be remembered, declined to be a party to the Industrial Conference, and the railway companies have always declined to take a hand in those Whitley Councils established in the trades which impinged on railway work. Whitleyites may, therefore, say, for what it is worth, that their movement has not even been considered by the parties so far involved in the present dispute.

The danger is, however, that the strike may spread. The members of other unions are being vigorously canvassed by their forward members, who hope to press them into it. One circular which is before us as we write, addressed to the men in a producing trade whose connection with the railway work is the remotest, says: "The above fight is our fight. The Government and the class from which it is drawn are admittedly determined to defeat the N.U.R. We are convinced that if the N.U.R. is defeated, the other unions will be defeated in turn." This shows the dangerous view, and if trade unionists can be persuaded in sufficient numbers to accept it, then we may expect to see sympathetic strikes in all directions. In that event the "fight to a finish" fraternity would rub their hands with delight. The industrial militarists would have won, the State would be bound by all the rules to accept the challenge, and the new world, of which Mr. Lloyd George talks, would be a very poor edition of the Mid-Victorian era.

There is, of course, an end for the time of all progress in the matter of reconstruction. The much-advertised economy campaign collapses at a stroke, and, instead of Government expenditure going down, it takes a sudden bound upward. The announcement with regard to out-of-work pay for all those affected by the strike may be good politics, but it is thoroughly bad business. The fight with the railwaymen promises to cost as much per day as the fight with the Germans. Meantime, food control and every other control runs along merrily, with an added excuse for activity. The chances of industrial revival are further removed than ever. Exportation is practically stopped, the exchanges everywhere have moved further against us, and six months' work has been ruined in a week. The nation will have a long reckoning with the railwaymen.

It would be short-sighted to overlook the world-wide effect of this disastrous stoppage. Strikes, riots, and revolution are the order of the day the world over. Peoples who are not so practised in self-control as ourselves have been to some extent restrained in their inclination for excesses by the glorious example of the British, who, until last Friday, had avoided any serious form of trouble. To-day every enemy of society anywhere, every agent of the forces of disorder, can draw advantage from the example of the English railwaymen.

Lord Salisbury used to say that in order to understand foreign politics it was necessary to have a big map. A rule of a similar kind might well be adopted which would lay it down that before forming an opinion on a political question it is always wise to consult a foreigner. Following this rule, we sought a conversation with a well-informed American, and, as usual, were not disappointed in the new light which we secured. The American railroads, like all industries in the States, started out with the problem of high wages; they have never had low wages, for there has never been a surplus of labour. A fundamental problem in the establishment of any industry in America is how to overcome the high rate of remuneration secured by labour. This is really the explanation of the high state of efficiency to which the Americans have brought mechanical appliances of all kinds. A hundred tons of coal are moved in America as one unit. The ten-ton railway truck is unknown, and right through the whole business everything is planned with a view to efficiency and to labour saving. Starting from this basis our American friend argues that we shall only attain efficiency in railway matters through high wages. He very rightly despairs of improvement until it is absolutely essential, and high wages would provide the necessity.

The immediate concern is how to get out of the present mess. There must, of course, be a definite victory for the Government on the strike issue, which is something different from the wage issue; some sort of a confession must be secured from the strike leaders which will render a repetition of their action impossible. On the other side, some way must be found of giving to labour generally the firm assurance that the Government is no party to a conspiracy to reduce wages. If our industrial magnates would all follow their best instincts and be led by those among them who have some real powers of imagination, they would put all their thoughts into machinery, equipment, and other efficiency problems, and dismiss from their minds the hankering after protection and low wages, which is the root cause of the present difficulty.

A chat with any sound trade unionist at the present moment will disclose the fact that the men have no confidence. They

suspect a trick; they fear an attempt to rob them of their hard-earned position. If the Prime Minister were to insist upon the dropping of all the minute mathematical manipulations and complicated arguments about percentages, which are the stock-in-trade of our officials, and which only lend colour to the suggestion that there is a "dodge" to get wages down, and substitute for all these things some simple formulæ capable of general understanding, the atmosphere might alter in a moment. Simple formulæ should not be incapable of invention, but they must be really simple; they must not be drafted by dialectical hair-splitters. What should be the difficulty about an understanding, backed up, if necessary, by an official order, that right throughout the whole realm of industry and employment a full month's notice must be given of any proposed alteration in wage rates? For our part we would not object to a period of three months' notice. It may even be possible to provide that no reduction in anybody's rate could be made except with the authority of the Court of Arbitration. The advantage of such an arrangement would be immediate: everyone would know where he stood. The workers want security: such an announcement could give it to them. Things would be stabilised for a time, and there would be an armistice, or a truce, which is all that industry requires at this moment. The formulæ would go on to state that a strike notice brought this arrangement to an end, and each union would then know that while its present money was secure, a strike would bring them face to face with the possibility of a wage reduction.

Italian Heavy Chemical Industry

Progress During the War Period

STATISTICS relating to the Italian chemical industry during the war show a considerable development in industrial chemicals, especially sulphuric and tannic acid, iron oxide, crude tartar, glycerine, and calcium carbide.

Italian chemical industries in 1913 employed 12,500 workmen, used 56,000 horse-power, and manufactured products to the value of £7,000,000. The principal chemicals produced were boric, hydrochloric, nitric and sulphuric acids; caustic soda in solution; sulphates of ammonia and copper; calcium hypochlorite; white lead; nitrate of potassium; calcium carbide; calcium cyanamide; glycerine; corrosive sublimate; borax; hyperphosphates; and chemical fertilisers. Exports in 1913 amounted to about £3,000,000, the principal items being boric, oleic, sulphuric, tartaric, and impure tannic acids, oxide of iron, corrosive sublimate, calcium carbide, citric acid, citrate of calcium, borax, tartar, glycerine, and perfumery. Much progress was made during the war, and numerous small plants were established to manufacture chemicals which could no longer be obtained from abroad.

There is a plentiful supply of iron pyrites, and 710,000 tons of sulphuric acid were produced in 1913. A plant in Lombardy, established in 1914, has a capacity of nearly 5,000 tons of nitric acid per year. Of calcium cyanamide some 17,000 tons were manufactured in 1914, and it is thought by some Italians that the production of great quantities of this commodity may in time free Italy from dependence upon Chile. With the addition of sulphate of ammonia, already produced in Italy, calcium cyanamide can be used as a nitrogenous manure.

Before the war Italy retained for use within the country about £4,000,000 worth of the chemicals and drugs of domestic manufacture and imported additional chemicals and drugs to the value of £6,000,000 per year. Of the products imported, the following were not manufactured within the country, or, if so, only in small quantities, and it is in some of these that foreign manufacturers and exporters have an opportunity:—Chlorides of lime, potash, and soda; chromates of the same; nitrates of all kinds; permanganates of potash and soda; sulphates of all kinds (except iron sulphate), particularly copper sulphate; bicarbonates; bisulphides and hypersulphides of potash and soda; silicates; bromine and bromides; iodine and iodides, acetates, particularly of lime; impure acetic acid; arsenic, carbolic, oxalic, sulphurous, and pure tannic acids; ammonia; caustic potash; impure caustic soda; oxides of lead, tin, and zinc; and non-alcoholic perfumery. Italy obtains chloride of potassium from Eritrea in considerable quantities. This product was formerly supplied by Germany. There is on hand only a small stock of many of the chemicals mentioned, and the prohibition of import by the Italian Government is all that prevents dealers laying in good stocks. Drugs are also very scarce and high priced, particularly those manufactured from coal-far products.

Chemical "Key" Industries

America's Progress Towards Independence

A SERIES of reports has been issued by the United States Tariff Commission, in which the progress made in the United States in the development of "key" industries is described in detail, and the *Board of Trade Journal* summarises the reports relating to optical glass, chemical glass-ware, potash and dyes, and coal-tar chemicals—industries in which America, like Great Britain, was largely dependent on Germany before the war.

Optical Glass

Up to the end of 1917 optical glass was not manufactured in the United States. It was imported, rough cut or unwrought, principally from Germany. In 1917, the United States entered the war, and the naval and military demands for optical instruments compelled the home production of suitable varieties of glass. The Carnegie Institution and the United States Bureau of Standards co-operated with four American manufacturers, and sufficient supplies of five types of glass were produced in 1918 to meet, with the imports from Great Britian and France, the requirements of the Army and Navy. By April, the industry had so far got upon its feet as to turn out 28,157 lb. of glass. Thenceforward, progress was rapid; 46,538 lb. in May, 85,295 lb. in June, 93,239 lb. in August, and, finally, 95,563 lb. in October. The principal types produced were ordinary crown, boro-silicate, barium crown, light flint and dense flint.

The report contains a description of the process by which during 1918 the manufacture of glass in the pots was completed in twenty-four hours, a saving of a day on the old method. The more rapid American method, due chiefly to early stirring, is claimed to yield optical glass of the best quality, wholly free from bubbles, of greatly improved colour, and also more free from striæ. The glass producers now desire protection in order that the new industry may be developed.

Chemical Glassware

Before 1915 practically all the chemical glass utensils used in America were imported, mainly from Germany and Austria. Since that year the industry has been established in America, where seven firms now produce factory-blown ware, and upwards of ten shops are engaged upon lamp-blown and volumetric ware. Not only are American factories now supplying the domestic demand, but during 1918 they exported chemical glassware to more than seventeen foreign countries. In 1913, the imports were estimated to range between 1,200,000 dols. and 1,500,000 dols. By 1915, the United States produced 950,319 dols. worth in their own shops and factories, and by 1918 the home production had gone up to 2,865,774 dols. There are no factories in America engaged exclusively in producing chemical hollow glassware, and it does not form a large part of the operations in the old-established factories, which, since the war began, have taken up the work. There have been no imports since 1915, and during the second half of 1917 the United States became exporters for the first time in their history.

Imported chemical glass utensils if used for manufacturing and commercial purposes, are subject to a duty of 45 per cent. *ad valorem*. They are duty free if imported for the use of educational institutions. The manufacturers now urge that this provision for educational imports should be withdrawn and all chemical glassware made dutiable at 45 per cent. *ad valorem*.

Potash

In 1913 the United States imported 270,720 short tons (2,000 lb.) of actual potash content (K_2O) of potash salts. Of this total, over 99 per cent. came from Germany, and there was no potash industry in the United States. Since then the imports have declined almost to a vanishing point, and during 1918 there were seventy-eight firms engaged upon the production of potash compounds. Their output was 192,587 short tons of crude material, containing 52,135 short tons of K_2O.

The United States were fortunate in possessing vast natural salt deposits and brines, and these formed the principal sources whence potash was drawn. The largest production came from the alkali lakes in the sandhill region of Northern Nebraska. The brine was pumped, the water driven off by heat, and the mixed salts recovered. They contained some 20 to 30 per cent. of potash. For the future it is expected that most of the potash will come from the semi-solid Searles Lake, California, and the Salduro Salt Marsh, Utah. During 1918 the actual potash

derived from the natural brines was 39,255 short tons, or 75 per cent. of the whole output. The principal other sources were alunite, dust from cement mills, kelp and molasses-distilling waste. Blast-furnace dust, as a store whence potash may be derived, appears to have been the subject of experiment, but the amount of potash yielded so far is small. It is, however, regarded as a source promising good results in the future.

Dyes and Coal-tar Chemicals

Before the war the United States received their normal supplies from Germany, and were compelled to improvise methods of production when the German supplies were cut off.

At the outbreak of war, the coal-tar chemical industry in the United States was insignificant, but, under the spur of necessity, it has since developed a substantial output. Two hundred and fifteen firms (not including coke-oven plants, gas houses and plants engaged exclusively in the manufacture of explosives and poison gases), reported the production during 1918 of chemicals derived from coal-tar. Under the Tariff Act of September 8, 1916, these coal-tar chemicals are divided into three groups. Group I comprises the crudes, which are on the free list; Group II the intermediates, dutiable at 15 per cent. and 2½ cents. per pound; and Group III finished products, dutiable in part at 30 per cent., and part at 30 per cent. and 5 cents. per pound.

	Number of manufacturers	Quantity (pounds)	Value
Group I.—Crudes, free	35	—	22,474,075
Group II.—Intermediates, dutiable ..	127	354,808,315	123,817,966
Group III.—Finished products	—	75,494,113	83,095,404
Dyes :—			
Dutiable at 30 per cent., plus 5 cents. per pound ..	—	52,517,235	57,535,934
Dutiable at 30 per cent.	—	4,638,365	3,770,106
Total of dyes ..	77	57,155,600	61,306,040
Colour lakes, dutiable at 30 per cent., plus 5 cents. per pound	29	9,590,537	5,020,023
Photographic chemicals, dutiable at 30 per cent., plus 5 cents. per pound ..	6	316,749	823,915
Medicinals, dutiable at 30 per cent. ..	31	3,623,352	7,792,984
Flavours, dutiable at 30 per cent. ..	7	458,256	4,925,627
Synthetic phenolic resins, dutiable at 30 per cent., plus 5 cents. per pound ..	5	4,233,356	2,642,120
Tanning materials (synthetic) ..	1		
Perfume materials ..	6	116,263	584,695

The finished products are now made almost entirely from American raw materials and intermediates. One hundred and seventy-six intermediates were made on a commercial scale and in addition 23 others were made in relatively small quantities for sale, for research, or for experimental purposes. The intermediates most needed are now being made on a large scale, although many important ones are still missing and the prices of many of them are still abnormally high.

From the above table it will be seen that the total output of dyes was 57,155,600 lb., valued at $61,306,040. This shows a gain over the 1917 output of 45,977,246 lb., valued at $57,796,228. The exports of "dyes and dyestuffs," including natural dyes, amounted to $16,921,888 during the fiscal year ending June 30, 1918. This may be contrasted with imports in the fiscal year 1914 of 45,840,866 lb. It is stated that, with comparatively few exceptions, prices of individual dyes were lower in 1918 than in 1917 in spite of the general rise in wages and prices of most other commodities.

The industry in America has made great progress during the last four years, but it is not yet on an economically sound basis. It is one-sided, and its costs are extremely high when compared with the prices at which German dyes were sold before the war. Some dyes were manufactured in excess of home requirements; others were altogether or almost missing from the lists. It was these missing dyes which formed the most profitable cargo in the German commercial submarine *Deutschland*. There is a gap in American production which, in the view of the Commissioners, must be filled.

Another competitive disadvantage of the industry is the high cost at which it is conducted. In many instances American costs are at present considerably above the pre-war prices at which German dyestuffs were sold. American high costs are partly attributable to the number of individual plants. It is pointed out that in other countries there is a concentration of capital and centralization of control. Even before the war there were in Germany only six prominent and seven minor companies manufacturing dyes. At present, it is stated that all of these are consolidated into a single "carte" for the avowed purpose of making a unified effort to regain the lost foreign market. In Switzerland the three leading firms have been unified. Almost the entire English industry also has been brought together in a single powerful company. The American situation stands out in strong contrast. In 1918 there were in the country 127 companies making intermediates and 77 making finished dyes. The Commission does not argue for or against industrial combination, but it points out that the numerous and mutually unrelated companies now producing coal-tar chemicals in the United States are less prepared for international competition than the highly centralized organizations that have been formed in Europe.

Trade with Germany

Advice for British Business Men

The Board of Trade have issued as a Parliamentary Paper (Cmd. 350, price 1d.) for the guidance of British traders, some notes on the conditions under which trading is now permissible with Germany and certain other countries. The notes supersede those published last July in the Parliamentary return Cmd. 274. It is pointed out that a considerable demand for all kinds of goods in the late enemy countries may be expected. As this market is now open to all the world, it is no part of the policy of the Government to discourage British traders from competing therein, and it is desirable that British traders should make every effort to secure a proper footing in Central Europe.

The conditions set out for trading with various countries, which have in many cases already been made known, are as follows :—

I.—Germany.

Exports.—Any goods may be sent to Germany without licence, except goods on Lists "A" and "B" of prohibited exports. Applications for export licences in respect of goods included in those lists should be addressed to the Export Licence Department, 1, Queen Anne's Gate Buildings, Westminster, S.W.1. It is understood that at present the import of all goods into unoccupied Germany is subject to import licence, for which the German consignee has to make application to the competent authority in Berlin.

Imports.—Any goods may be imported from Germany, and paid for, without licence, except goods whose importation from *all* foreign countries is prohibited. Import prohibitions now apply only to a small number of goods, a list of which will be found in the *Board of Trade Journal* of August 28, 1919.

Other Transactions.—Other transactions of a commercial or financial nature with firms in Germany are permissible without further licence, provided they do not involve any of the following matters—namely :—

(*a*) The payment of money arising out of pre-war transactions;
(*b*) The delivery of, or dealing with, property held in this country for persons in Germany since before the outbreak of war;
(*c*) The transfer of securities by or on behalf of a person in Germany;
(*d*) The allotment or transfer of securities issued by a company to or for the benefit of a German subject;
(*e*) The transfer of any debt or other obligation due to a person in Germany.

It should, of course, be understood that, as regards the financing of transactions, traders must make the best arrangements they can, and, in case of uncertainty as to the best mode of procedure, they should consult their bankers.

II.—The Territories Previously Included in the Austro-Hungarian Dominions.

The British regulations are the same as those set out above in the case of Germany, except that List "D" applies in the case of exports to Austria and Yugo-Slavia.

III.—Turkey and Bulgaria.

Except that List "D" of prohibited exports applies to Turkey, and Lists "D" and "E" to Bulgaria, the British regulations are the same as for Germany.

IV.—Norway, Sweden, Denmark, Holland, and Switzerland.

It is no longer necessary to obtain certificates from importing associations in these countries, or to procure other forms of guarantee, or to consign goods to such associations. Export licences, for which application should be made to the Export Licence Department, at the address given above, are required only for goods on Lists "A" and "B" of prohibited exports.

V.—Poland, Finland, Esthonia, Lettland, Lithuania.

So far as British regulations are concerned, there are no special restrictions on trade with these countries, but, as in the case of other foreign countries, export licences are required for goods on Lists "A" and "B," and general prohibitions of import apply to these as to other countries.

Further information regarding the export of goods to the above and other countries will be found in the "List of Export Prohibited Goods," which is published fortnightly by the Export Licence Department of the Board of Trade, 1, Queen Anne's Gate Buildings, Westminster, S.W.1.

Consular Certificates of Origin and Interest.—These certificates are no longer required for goods imported into this country.

Declarations of Ultimate Destination and Disclosure of Names of Consignees.—These declarations will no longer be required to be made in respect of exports from the United Kingdom, and disclosure of the name of the consignee on bills of lading or shipping manifests is unnecessary, except in a limited number of cases where the Export Licence Department may continue to specify on an export licence the name of the consignee.

Dyestuffs Licensing System

A memorial has been prepared by the British Chemical Trade Association for submission to the Prime Minister requesting:—

(1) That representation upon the Licensing Sub-Committee shall be granted to representatives of the smaller manufacturers, of merchants, and of independent consumers.

(2) That the so-called "Central Importing Agency" shall be abolished, and that if such an organisation is necessary at all, the work should be done either by (a) a Government Department, who have no trade interests; or (b) an association representing the trade as a whole, and which would afford equal protection, facilities, and information to all its members.

(3) That a deputation may be received to explain in greater detail the trade point of view on the matter referred to.

Petroleum Prospecting Regulations in Colombia

A Decree regulating prospecting for petroleum-bearing lands, and arranging for the keeping of statistics in petroleum wells was passed by the Colombian Government on June 20. Under the new Decree, the *Board of Trade Journal* states, the permission of the Government must be obtained before prospecting work of any description can be carried out, and all concerns, whether of individuals or companies, occupied in the work of prospecting for petroleum, must comply with the following regulations:—

(a) They must inform the Government through the Ministry of Public Works of the Work they propose to undertake, and, if they have already begun, must furnish a report on the result of their prospecting, stating the number of borings or perforations made, the depth of the wells, etc.

(b) They must send, with their report, to the Ministry of Public Works, labelled samples of the petroleum extracted and a topographical sketch of the zone prospected.

(c) If the prospecting work has been carried out on lands belonging to private persons, a declaration to that effect must be made, and at the same time the original title deeds should be described, with a statement as to whether the lands were at any time unappropriated, and if so, the date of their adjudication must be shown.

Prospectors who have carried out research work to the satisfaction of the Government, fulfilling all the conditions laid down in their permit, will, from the date of the expiration of the permit, have a limit of six months in which to make a proposition to the Government for the drawing up of a contract of exploitation.

Permits will be granted subject to the following conditions in addition to such others as may be considered necessary.

(1) The term of the permit shall be for one year, counting from the date of its concession, which may not be exceeded.

(2) The area of the zones for prospecting must be limited in each case according to the circumstances of the district in which they are situated, such as being easy or difficult of access and penetration, proximity to the coast, etc. Its surface may be from 10,000 to 30,000 hectares, which the Minister will settle according to the importance of the district.

(3) In the zone of the permit only the person to whom it has been granted may conduct prospecting work. The permit may not be transferred to any other person or legal representative.

(4) The concessionaire must furnish the Government with monthly reports on the condition and progress of the work.

(5) Immediate notice must be given of the discovery of drippings or springs of petroleum.

(6) When excavations, wells, or perforations on any scale do not produce petroleum in commercial quantities, they should be properly covered in.

The prospector for petroleum wells must present the permit to the mayor of the municipality where the prospecting takes place, while the latter must demand the production of the permit before allowing prospecting, and must report to the Ministry of Public Works on prospecting work being carried out, and give notice of permits presented to him, and governors, prefects, etc., in the whole of the Republic will report to the Government within the shortest period possible, any negotiations which may have been carried on for prospecting, etc., of petroliferous mines, whoever the owner of the soil may be. The obligation to keep statistics of gold, silver, and platinum mines is extended to petroleum. It should be noted that there is nothing in the Decree to indicate that adequate protection will be given to permit-holders to exploit the oil-bearing lands, for although they may be put to considerable expense in locating the oil, they have no certainty of procuring a contract from the Government, who appear to reserve to themselves entirely arbitrary rights in the matter.

The Asphalt Industry of U.S.A.

Despite the curtailment of the imports of native asphalt and of road and building construction in the United States caused by the war, the year 1918, it is stated in the *Board of Trade Journal*, was one of prosperity for the domestic asphalt industry. Although the output in 1918 was a little less than that in 1917, the value exceeded that of any preceding year, and the general prosperity of the industry was shared by practically all its branches.

In a memorandum issued by the Geological Survey it is stated that the uses of asphaltic materials, including both native asphalt and asphalt made from petroleum, as well as gilsonite, grahamite, and elaterite, in buildings and other structures are manifold. As they are elastic, antiseptic, acid-resistant, and moisture proof, these materials are being widely employed for use in flooring and roofing, in waterproof coating, and in electric insulation, as well as in the manufacture of varnish, paint, and putty. Although these materials have been marketed for relatively few years they are in general demand among contractors and engineers, and their use is rapidly increasing.

Gilsonite, the purest known hydro-carbon, has found great favour in the rubber industry. As pure rubber is sensitive to heat and cold, it cannot be used advantageously for making products that are exposed to extreme temperatures, but when it is mixed with gilsonite and the mixture is vulcanised, the rubber undergoes changes in composition that enable it to resist variations in temperature as well as oxidation. The product of this mixture which is called mineral rubber, is well adapted to outdoor use, and the demand for it is increasing.

Ozokerite, a native paraffin, is utilised in the manufacture of leather polish, sealing wax, electrotypers' wax, candles, electric insulation, carbon paper and ink. Before the war all the ozokerite used in the United States was imported, chiefly from Galicia, but when that source of supply was cut off a search was made for deposits in the United States, and this hydro-carbon first entered the market from domestic deposits in 1916. Most of the output in 1918 was used as an acid-proof coating for electrotypers' plates.

Statistics of Production

According to statistics compiled by the Geological Survey the quantity of asphalt and allied substances produced in the United States in 1918 was 1,237,853 short tons, valued at 18,540,032

dols., a decrease in output of only 190,473 short tons, or about 13 per cent. but an increase in value of 2,627,604 dols., or 16.5 per cent., compared with the production in 1917, which was 1,428,326 short tons, valued at 15,912,428 dols.

Although the demand for imported native asphalt is still large, the relative abundance and adaptability of petroleum asphalt has reduced considerably the production of native bitumens and bituminous rock from domestic quarries. However, the increased price received by producers of domestic native bitumens more than offset the decline in output.

The crude native ashpalt and allied substances imported for consumption in the United States in 1918 aggregated 115,663 short tons, valued at 814,752 dols., a loss in quantity of 72,702 short tons, or about 39 per cent., and in value of 305,105 dols., or 27 per cent., compared with 1917. The resumption of normal conditions will probably restore the import trade of the United States in asphalt to its pre-war proportions.

The quantity of petroleum asphalt (including road oil and flux) produced in 1918 from oil of domestic origin was 527,575 short tons, valued at 7,435,204 dols., a decrease in output of 174,234 short tons, or about 25 per cent. and in value of 299,487 dols., or only about 4 per cent., compared with 1917, but the corresponding material manufactured in this country from Mexican petroleum increased one per cent. in quantity, and nearly 39 per cent. in value.

The native bitumens and allied substances, including gilsonite, grahamite, elaterite, bituminous rock, and ozokerite produced from mines and quarries in the United States in 1918 was 60,034 short tons, valued at 780,808 dols., a loss of 20,870 short tons in output, but a gain of 44,884 dols., in value, compared with 1917.

In July an Asphalt Association was formed with offices in New York. It is stated that the Association is to co-operate with public officials, scientific organisations, engineers and contractors in developing and improving methods of asphalt utilisation. The Association will maintain a corps of field engineers, and a research department.

Chemistry of "Burgundy Mixture"

The chemistry of "Burgundy mixture" is practically important, because to give it the greatest efficiency it should possess a maximum fungicidal power and a minimum potentiality for injuring foliage. The reaction of sodium carbonate and copper sulphate solutions has been studied by Pickering and by Ravaz, but, according to a paper contributed to the August *Journal of the Chemical Society* by Messrs. Robert L. Mond and C. Heberlein, the problem is more complex than they considered. The latter authors have studied the reactions of copper sulphate with varying proportions of sodium carbonate and of sodium hydrogen carbonate; have determined the amount of absorbed sodium carbonate and the ratio of copper oxide to carbon dioxide in the various precipitates and the amount of basic copper sulphate in the mixtures; and have studied the solvent action of carbon dioxide and the change of the colloidal precipitate to a crystalline form. As a result of their experiments Messrs. Mond and Heberlein conclude that three distinct copper compounds are formed when sodium carbonate and copper sulphate solutions are mixed:—(1) Insoluble hydrated basic copper carbonate (the bulk of the precipitate); (2) insoluble hydrated basic copper sulphate; and (3) soluble basic copper sulphate in the form of a hydrosol, the proportions of which vary with the conditions of precipitation. One molecule of copper sulphate is completely transformed by 0.93 molecule of sodium carbonate instead of the 1 molecule theoretically necessary. In a 1 per cent. mixture of copper sulphate and sodium carbonate (in the proportion 1 : 0.93 mol.) made at 15°, 9.6 per cent. of the copper is present as soluble basic sulphate, the basic carbonate contains copper oxide and carbon dioxide in the ratio 2.2 : 1, the insoluble basic sulphate contains copper oxide and sulphur trioxide in the ratio 15 : 1, the precipitate contains absorbed sodium carbonate in the proportion of 1 part to 74 of copper oxide, and 52.4 per cent. of the carbon dioxide is evolved. At higher temperatures more carbon dioxide is evolved, all being expelled on boiling. The amount of basic sulphate formed decreases as the proportion of sodium carbonate increases, the proportion in solution (but not that of the basic carbonate) increasing with the amount of free carbon dioxide. At first the precipitate is wholly colloidal, but eventually it becomes crystalline, the colloidal condition apparently being conditional on the absorbed sodium carbonate. The transformation is accelerated by free copper sulphate, carbon dioxide, or sodium hydrogen carbonate, but retarded by sodium carbonate or 0.02 per cent. of glue.—*Nature*.

John Lysaght, Ltd.

Development of the Business

At the ordinary general meeting of John Lysaght, Ltd., held on Tuesday at Cannon Street Hotel, E.C., the Chairman, Mr. H. Seymour Berry, said that the most satisfactory features of the business lay in the fact that the operations of the company included every process required in the manufacture of its chief productions, commencing with the mining of the iron ore, and ending with the distribution of their output in the markets at home and abroad. As they were independent of outside purchases of raw material, uniformity in quality was obtained, and the continued excellence of the brands of finished sheet-iron, for which they held so high a reputation all over the world, was assured.

The sheet-iron industry was the most important part of their business, but there were other important branches from which profits were derived. They did a large amount of constructional engineering, and were big makers of wire netting. They had their own spelter works, and were engaged in many other adjuncts to sheet-iron working. Gradually they were passing from the war stage to a resumption of their usual trade. The steel works at Scunthorpe, which was now one of the best-equipped works of its kind, were steadily increasing their output, and at Newport their rolling mills were rapidly getting back to pre-war figures. On the whole, the prospects might be considered satisfactory, but there was one thing that they dared not lose sight of, and which had to be taken to heart by employers, workmen, and every section of the community. Half the population of Great Britain was supported by its export trade, and unless the productions could be manufactured in this country at costs which would enable them to compete with the United States and other countries in the markets of the world their trade could not be held. In the manufacture of sheet iron, &c., 5 tons of coal were required, from first to last, to manufacture the finished product, and the present prices of coal in this country compared with the American price placed them at a disadvantage in comparison with their position before the war

Staveley Coal and Iron

New Work in Hand

Presiding at the annual meeting of the Staveley Coal and Iron Co. (Ltd.), at Sheffield on Tuesday, Mr. Charles Markham said that with regard to new work the policy of the board was not to stand still, and they were going to proceed with all the schemes that had been laid out and matured for so many years. They were building a further 66 coke ovens at the Devonshire Works, and he had no doubt that in the near future they would be putting up more blast furnaces. The directors, last week, were round the ironstone mines of Northamptonshire and Leicestershire, and they were quite satisfied that with 100 million tons of available stone in sight the putting down of coke ovens would no doubt be a remunerative business. They had also a pit to sink in the works yard, and they had christened it by the name of an old pit which stood a few hundred yards away—the Dowell. All the pits in the old days were "wells"—the Dowell, the Farewell, and the Hopewell, and they had now resuscitated one of the old names. They had another pit to sink at Warsop. Brodsworth was sinking to the lower seams to prove them. Markham Main, which, as he had explained before, was originally started as between the Bullcroft Company and the Staveley Company, now seemed such a stupendous affair that they had taken in two other partners, the Brodsworth Company and the Hickleton Company. There had been a great deal of talk about concentration of forces, and in a quiet way he thought they could consider that the Staveley Company had some very large holdings in South Yorkshire in connection with its various interests.

They were coupling up the whole of the South Yorkshire collieries of any importance with an electric wire, and they had joined together in a certain manner, for the disposal of their coal, under the name of the Doncaster Colliery Association, although it was not quite good enough for the railway company, who wanted the personal guarantee of the directors for the tolls, despite the fact that the Association had a subscribed capital already of £400,000. Things were rather better in South Yorkshire than they were in Derbyshire as regards coal turning, although they had a longer strike than in Derbyshire.

Institute of Metals

THE following were among the papers read at the recent meeting of the Institute of Metals :—

The Ternary Alloys of Tin-Antimony-Arsenic

By Dr. J. E. Stead, D.Sc., F.R.S., with notes by Mr. L. J. Spencer, M.A., F.G.S.

This paper contained a short review of a paper read before the Society of Chemical Industry, in 1897, on the ternary alloys of tin-antimony and tin-arsenic, in which it was shown that cold alloys containing between 92.5 and 75 per cent. tin and 75 and 25 per cent. antimony contain cuboidal crystals having the composition of SbSn embedded in a eutectic consisting of a solid solution of 92.5 per cent. tin and 7.5 per cent. antimony; also that cold alloys containing traces of arsenic up to 5 per cent. and 99.95 per cent. and 95 per cent. tin contain crystals in the form of flat plates, which, on being separated, were found to have approximately the composition of Sn_3As_2, and a matrix of practically pure tin.

The separated crystals have been recently examined by Mr. J. L. Spencer, who describes them as rhombohedrous (trigonal), and the only faces present the large basal plane *c* (111) forming the surface of the scales, and the rhombohedron *r* (100) at the edges. There is a perfect cleavage *c* (111) parallel to the surface of the scales.

The interesting feature of the paper is the character of the ternary crystals that form when some of the alloys containing tin, antimony, and arsenic solidify. In the slowly cooling alloy containing 70 per cent. tin, 25 per cent. antimony, and 5 per cent. arsenic, more or less complete spherical shells grow, leaving as the matrix the eutectic of the ternary alloy of tin, plus antimony, which contains only traces of arsenic.

If the alloys contain less than 2.5 per cent. arsenic when associated with 25 per cent. of antimony and the balance of tin, the crystals formed are cuboidal, and not spherical, but when the arsenic exceeds 2.5 per cent., the antimony remaining at 25 per cent., the crystals begin to change from the cubic to the spherical form.

It is not till the crystals themselves contain a ratio of arsenic to antimony of more than 1 to 7 that the spherical forms become pronounced, but in every alloy no arsenic remains in the eutectic, for all of it crystallises out in the ternary crystals, whether they are cuboidal or spherical.

When the arsenic is maintained at 5 per cent. and the antimony varied, it is not till the antimony exceeds about 8 per cent. that the perfectly flat crystals begin to change into segments of spheres. In these alloys the whole of the arsenic is included in the separate crystals, and none remains in the eutectic.

When an alloy containing 70 per cent. tin, 25 per cent. antimony, 5 per cent. arsenic, is slowly cooled, so as to lead to the formation of very large spherical crystals, and the cold alloy is strongly etched, the central portions of the spherical shells resist the attack and remain white, and the crystalline matter enveloping these nuclei, which subsequently fell out of solution, are stained a brown colour. It is further shown that the exterior borders of the complete crystals consist of aggregations of cubes, from which it is evident that the crystals that first form contain more arsenic than those which fall out of solution at a later period.

In an appendix to the paper presented the author gave analyses of the fragments of the cleavages from the central portions of the spherical crystal shells, and yielded on analyses 60.15 per cent. tin, 27.5 per cent. antimony, and 12.45 per cent. arsenic. It was impossible to separate the first portions that fell out of solution by chemical means, and it is possible that what was separated mechanically included other portions of the crystals. The analysis just given only proves that these portions contain about twice as much, or more, arsenic than what fell out at a later period.

The analysis of the whole crystals approximated to 48 per cent. tin, 42 per cent. antimony, and 10 per cent. arsenic. When 50 per cent. of these crystals were melted with 50 per cent. of the eutectic of tin-lead, the crystals found on solidification were more or less spherical in form. Crystallised out of the eutectic of lead-antimony, the crystals were also spherical, but other crystals of undetermi'nate form were also present adhering to the walls of the spherical segments.

The composition of the flat, platy crystals separated from the alloys containing arsenic, constant at 5 per cent., together with 4 per cent. and 6 per cent. antimony, contained :—

Alloys.	*Yielded Crystals in Flat Plates.*
Tin 91%, Antimony 4%, Arsenic 5% =	Tin 64.3%, Antimony 6.2%, Arsenic 29.5%.
Tin 89%, Antimony 6%, Arsenic 5% =	Tin 64.5%, Antimony 6.73%, Arsenic 28.8%.

In the alloys containing more antimony, from 8 per cent. to 10 per cent., the crystals contained :—

Alloys.	*Yielded Spherical Crystals.*
Tin 87%, Antimony 8%, Arsenic 5% =	Tin 63.63%, Antimony 18.27%, Arsenic 18%.
Tin 85%, Antimony 10%, Arsenic 5% =	Tin 56.50%, Antimony 27.80%, Arsenic 15.7%.

It was difficult to calculate the chemical constitution of crystals of such mixed and complex nature. It is evident, however, that until the ratio of antimony to arsenic exceeded 1 to 1 the spherical crystals of pronounced character did not form; on the other hand, cubic crystals did not begin to change to the spherical form until the ratio of antimony to arsenic in the crystals exceeded about 7 to 1.

The alloys are very brittle, cleavage following the central part of sheet crystals. For that reason, excepting for the production of ornamental objects, they are of no commercial value. No attempts have been made to explain why idiomorphic spherical crystals should take spherical form, and the discussion of this is left until more research has been made.

Early History of Electro-silver Plating

By R. E. Leader, B.A.

This paper began with the time when John Wright, a young Birmingham surgeon, found in cyanide of potassium the secret by which the electro-chemical deposition of the precious metals became a manufacturing possibility. The epoch-making date was September, 1840, when Wright's process, embodied by agreement in a patent taken out by George Richard Elkington and Henry Elkington, became the basis of all future electro-silver plating. But before that basis had been unassailably fixed there was a long period of anxiety. The manufacturers of Old Sheffield plate were contemptuous; retailers were mostly hostile, and their hostility was confirmed when unsatisfactory goods, returned on their hands, seemed to justify public scepticism. The patentees' policy of committing the industry by deputy to production by licences, rather than by themselves, was received with such coldness as to show that by the activities of their own workshops must the mercantile value of their invention be proved. But beyond details of manipulation and output, the validity of the patent was challenged from many quarters, and protection was sought for a multiplicity of rival methods. The Elkingtons resisted all these assaults, and, while upholding their own priority, strengthened their monopoly by acquiring control over all real improvements, whether by way of new solutions or by devices for the more efficient application of electrical energy. While enthusiastically devoted to the development of the artistic possibilities of electro-plating, one of the most outstanding successes of the Elkington firm in popularising their new method was the acquisition from Krupp, of Essen, of machinery for producing, in unlimited numbers, cheap yet durable spoons and forks. In something like ten years the manufacture of old Sheffield plate had been killed, and electro-plating had furnished the households of the large middle-class area, between the sterling silver of the rich and the Britannia metal of the poor. While commending the artistic application of electro-plating they desired to guard themselves against pronouncing on its merits for objects of domestic use.

The paper, confining itself to early history, did not discuss the great developments of electro-silver plating since that period.

Constitution and Metallurgy of Britannia Metal

By F. C. Thompson, D. Met., and F. Orme, M. Met.

The authors' notes did not pretend to represent exhaustive research, but were offered as a step towards further investigation. The full analysis of the alloy used, which is typical of good modern material, is :—Tin, 93.38 per cent.; antimony, 4.70 per cent.; copper, 1.0 per cent.; lead, 0.56 per cent.; iron, 0.36 per cent.

Samples of the alloy were taken (1) as received (*i.e.* as cut from a commercial ingot); (2) after heating to 170° C. and quenching; and (3) after re-heating to 200° C. and slowly cooling; and the Brinell hardness determined. The quenched sample was up to a point, distinctly harder than either the sample as received or that re-heated. When, however, the stress passed a certain value (600 kgs.) the material broke down, and became actually softer than the untreated samples. The effect of re-heating, followed by slow cooling, is to soften the alloy distinctly. In the rate of cooling, rather than the temperature from which the alloy is cooled, does the cause of the hardening lie. Thin discs, cast in cast-iron chills, were comparatively very hard. According to the scleroscope, their hardness was double that of the ingot (12—6), although the Brinell figures differed comparatively little.

In the absence of the thermal equilibrium diagram it is difficult to discuss the micro-structure of britannia metal. However, the authors suggest that the constitution of the alloy is one of the Sn—Sb delta solution, embedded in the Cu—Sn eutectic as ground-mass. Both of these constituents freeze at about the same temperature, the cooling curve showing but one large and rather expanded evolution of heat at 235° C. After quenching, and after chill-casting, there is a marked diminution in the amount of the white constituent present.

MR. HARRY SPIVEY, the President of the Heckmondwike (Yorks.) Chamber of Commerce, made a strong complaint at the last meeting of the Chamber, concerning the extent to which existing regulations are handicapping country dyers and manufacturers who do their own dying. Mr. Spivey pointed out that although the British Dyes and other firms had succeeded in producing several dyestuffs formerly made only in Germany, it could not be maintained that these were produced in adequate quantities to meet the country's requirements. He alleged that the British Government were bent upon the creation in this country of a monopoly in favour of home producers of dyestuffs. Unfortunately, country dyers and manufacturers were at their mercy. Unless British textile manufacturers were supplied with German dyestuffs they could not maintain the quality of the colouring essential for their success, and would be hopelessly handicapped in their competition with America.

Motor Spirit Maximum Prices

THE BOARD OF TRADE has issued an order bringing motor spirit (used or capable of being used for supplying motive power to motor vehicles, whether taxed or not) within the Profiteering Act, 1919. The order comes into force forthwith, and the following maximum prices have been fixed under it :—

Maximum Wholesale Prices

SPIRIT—IN CANS.

Aviation	2s. 10d.	per gallon.
Special Boiling Points	2s. 8d.	,, ,,
No. 1	2s. 8d.	,, ,,
No. 3	2s. 6d.	,, ,,

For delivery to commercial consumers (not for re-sale), in steel barrels, 1d. per gallon less than can price; and for delivery in bulk to commercial consumers (not for re-sale), 1½d. per gallon less than can price. One penny per gallon to be added to all above prices when sold for delivery in Scotland or Ireland.

Maximum Retail Prices

The maximum price at which motor spirit may be sold by retail shall be the delivered price per gallon to the retailer, with an addition of fourpence halfpenny a gallon. Quantities less than a gallon shall be sold at a price proportionate to that charged per gallon.

Where motor spirit is delivered by a retailer to a purchaser at any place other than the retailer's place of business, an extra charge at the rate of one penny for a gallon or for any part of a gallon may be added to the price permitted by this Order.

Odams' Nitro-Phosphate and Chemical Co.

THE sixty-seventh ordinary general meeting of Odams' Nitro-Phosphate and Chemical Co. (Ltd.) was held on Wednesday in London, Mr. Frederick Richardson (deputy chairman) presiding.

The Chairman said the company had made a gross profit of £24,958, as against £16,197 in the previous year, or an increase of £8,761. The directors proposed to place £1,500 to reserve, to pay a dividend of 15 per cent., which would absorb £6,750, and to carry forward £4,784. There was a possibility of a shortage of raw material during the coming year. With the return to peace conditions a larger demand had arisen for raw phosphate, whilst, on the other hand, owing to strikes and other causes, it looked at present as if the supply would be less than last year. The matter would, however, have the careful attention of the directors.

Mr. F. B. Lacy (managing director), in seconding, said that up to June 30 they had been supplied with sufficient phosphate for their requirements, whilst since that period they had made arrangements with allied manufacturers for combined purchases, and at present that arrangement was working satisfactorily. The difficulty was that the French Government had taken away a large quantity of the plant at the phosphate mines, and as a result they were only able to turn out about half the quantity of the last few years, whilst the phosphate mines in Florida had been closed since May last owing to strikes, and the world's supply of phosphate as a result was going to be very considerably reduced.

Oilfields Finance Corporation

The Outlook for Oil

MAJOR R. W. BARNETT, M.P., presiding on Wednesday at the meeting of the Oilfields Finance Corporation Ltd., announced that the year's working showed a net profit of £64,019, as against £40,269, an increase of more than 50 per cent. on the previous twelve months. The directors recommended a dividend of 20 per cent., as compared with 25 per cent. for the corresponding period, but the proposed capitalisation of reserves is expected to give the shareholders a very substantial bonus.

Major Barnett said he was not one of those who believed that the reign of oil would prove perpetual. At the present rate of consumption half a century would exhaust the proved petroleum resources of the world, and, although new oilfields would doubtless be discovered, it was probable that demand would grow at least as rapidly as supply. The distillation in low-temperature retorts of coal and allied minerals would in time do something to augment the supply of fuel oil, but it was necessary to be on their guard against exaggerated hopes of production from this source. An eminent admiral, stated in the *Times* a few weeks ago, that " so long as a pound of coal exists, there exists, say, half a pound of oil with further research." He was afraid he must join issue with that statement. At the request of the late Sir Boverton Redwood—whose loss to the oil world they could none of them sufficiently deplore—he had accepted more than two years ago the chairmanship of an important committee, appointed under the auspices of the Institution of Petroleum Technologists, to investigate the production of oil from coal, and he could say with some authority that, apart from the fact that anthracite coal contains no oil whatever, it would take much research to find more than 25 gallons in the average ton of bituminous coal, so that Lord Fisher's " half a pound of oil " would dwindle into something like 1½ oz. Undoubtedly for some years to come the best method of obtaining petroleum would be by drilling for it. The life of King Oil might be comparatively a short life, but it would be at least a merry one. While supplies lasted, and they would probably last out our time, it would be difficult to set limits to the prosperity of the petroleum industry, and in that prosperity he was confident that their company would have its full share.

The Calendar

Oct. 3	Society of Chemical Industry (Manchester Section). Chairman's Address, and Paper by Mr. J. Allan. (Some Notes on the Rhineland Chemical Works.)	The Grand Hotel, Manchester.
4	The Mining Institute of Scotland. " Oil Possibilities in Scotland," by Mr. H. M. Cadell, B.Sc.	The Heriot Watt College, Chambers Street, Edinburgh.
7	The Industrial League and Council. " Some Trade and Labour Problems," by the Right Hon. G. H. Roberts, M.P.	Guildhall.
7	Sheffield Association of Metallurgists and Metallurgical Chemists. " Some Notes on the Effect of Dimensions on the Deformation of Steel," by T. E. Stanton, D.Sc., F.R.S.	Royal Victoria Hotel Assembly Room, Sheffield.
8	The Industrial League and Council. Conference on Scientific Management, Addresses by representatives from the managerial staff and workers of Messrs. A. Lloyd & Co.	Guildhall.
14	Sheffield Association of Metallurgists and Metallurgical Chemists. " Fuel Economy in Steam Raising," by R. Howson.	Royal Victoria Hotel Assembly Room, Sheffield.
21	Sheffield Association of Metallurgists. General Discussion on Nickel-Chrome Steels, based on Iron and Steel Institute Papers Nos. 1, 6, and 11, September, 1919.	Royal Victoria Hotel Assembly Room, Sheffield.
28	Sheffield Association of Metallurgists and Metallurgical Chemists. " Some Microscopical Effects of Static and Dynamic Stresses," by G. R. Bolsover, Assoc. Met.	Royal Victoria Hotel Assembly Room, Sheffield.
Nov. 1	Institution of Automobile Engineers.	Royal Society of Arts, John Street, Adelphi, W.C.
7	Society of Chemical Industry. (*a*) The Estimation of P-Phenylene Diamine. By T. Callan, M.Sc., Ph.D., and J. A. R. Henderson, D.Sc. (*b*) The Estimation of Sulphuric Acid in the presence of Organic Sulphonic Acids. By T. Callan, M.Sc., Ph.D., J. A. R. Henderson, D.Sc., and R. Barton, Esq.	Grand Hotel, Manchester.

From Week to Week

MR. PIERCE LACY, of the firm of Cutler & Lacy, of Birmingham, has joined the board of the United Glass Bottle Manufacturers.

SIR HARRY SEYMOUR FOSTER has been elected Master of the Glaziers' Company.

PLANS HAVE BEEN APPROVED for additions to Sketchley Dye Works, Barwell, for Messrs. A. E. Hawley & Co.

ALTERATIONS AND ADDITIONS are to be made to the chemical works of Messrs. C. Norrington & Co., Cattedown, Plymouth.

A SETTLEMENT HAS BEEN REACHED in the Lorraine mining dispute. As a result it is expected that a greatly increased quantity of Alsatian potash will shortly be available for distribution.

THE SUM OF £14,802 (net personalty £14,355) has been left by the late Mr. James Atherton, of Yoldons, Albert Road, Bolton, Lancs, lately director of the Tyldesley Coal Co., Ltd.

DAMAGE AMOUNTING TO several thousand pounds has been done by fire at the tannery works of Messrs. William Walker & Sons, Bolton.

WARRANTS IN RESPECT OF THE SIX PER CENT. PREFERENCE SHARES dividend for the half-year to September 30 of the Union Cold Storage Company have been posted.

THE LATE MR. CALEB WILLIAM ROBERTS, Wollaston Hall, Stourbridge, chairman and managing director of Messrs. Roberts & Cooper, Ltd., iron and steel manufacturers, &c., has left estate valued at £160,977.

PLANS, BY MR. J. T. JOHNSTONE, for a petrol store in Flamborough Road, Bridlington, for the Anglo-American Oil Co., Ltd., have been submitted to the Bridlington Corporation. The company is also erecting petrol tanks and a garage in Bridgeman Street, Bolton.

THE AIR RAID COMPENSATION COMMITTEE is dissolved, and their office at 13, Abchurch Lane, King William Street, E.C., was closed on October 1. All correspondence regarding the business of the Committee should now be addressed to the War Risks Insurance Office, 53, Cornhill, E.C.

FINES TO THE AMOUNT of £60 were imposed at Marylebone Police Court last week on Alfred John, manufacturing and retail chemist, trading as Rouse & Co., at Wigmore Street, for selling tincture of iodine, and having in his possession liquor thymol—both of which are capable of being used internally as medicine—in the preparation of which methylated spirits had been used.

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom for the week ended September 27 were 20, an increase of three. The numbers of bills of sale registered and re-registered was 109, an increase of 46. Mortgages and charges registered by limited companies amounted to £202,750, the amount authorised (where stated) being £5,000.

A NEW ORGANISATION, entitled the American Society of Biological Chemists, has been incorporated with the purpose of furthering the extension of bio-chemical knowledge and facilitating personal intercourse between American investigators in biological chemistry. The headquarters of the new society are at Manhattan.

MR. R. BRUNNER (chemicals), National Confederation of Employers' Organisations, Mr. Max Muspratt (chemicals), Federation of British Industries, and Mr. E. V. Williamson, secretary, Associated Glass Bottle Manufacturers, have been appointed members of the Central Committee appointed by the Board of Trade under the Profiteering Act.

IT WAS REPORTED IN EDINBURGH on Wednesday that liquid oil had been discovered in the shale field at West Calder, Mid-Lothian, where boring operations by Messrs. Pearson & Sons have been in progress for several months. It is stated that when a sample of sandy soil taken at a depth of over 600 ft. was examined, it was found to contain oil. Further boring revealed oil percolating through in small quantities.

THE ATLANTIC LOBOS OIL CO., incorporated in Delaware, with a capital of $10,000,000 Preferred and $500,000 Common shares, and no stated value, will, it is stated, merge the Port Labos Petroleum and Atlantic Oil Companies. The former is the second largest Mexican oil exporter; the latter is a subsidiary of the Atlantic Refining Co., one of the largest subsidiaries of the former Standard Oil Trust. The president of the new company is to be Mr. W. Irish, vice-president of the Atlantic Refining Co.

IN ORDER TO RELIEVE THE SITUATION created by the heavy commitments of crushers in Bombay cottonseed, the Food Controller has decided to support applications for licences for the export of crude Bombay seed oil and technical refined cottonseed oil up to a total of 10,000 tons. The Controller has further decided to remove cottonseed oil from the schedule of the Oils and Fats Order, 1919, and permit purchases of such oil for soapmaking and other purposes.

DR. RIPPER, the acting Vice-Chancellor of Sheffield University, in welcoming the members of the Institute of Metals on Wednesday week, said there was no city that owed more to science than did Sheffield. They knew something of what the steel chemist had done for Sheffield. Forty or fifty years ago people would have wondered what was meant by a steel chemist, yet to-day there was no works in Sheffield of any importance, that had not its staff of steel chemists and its research department.

SIR JOHN CADMAN, K.C.M.G., head of the Petroleum Executive, in an interview with the editor of the *Petroleum Times*, makes it clear that there will be no Government interference in the development of the oil-shale deposits in Great Britain. "The policy," he said, "of the Petroleum Executive with reference to the development of the oil-shale industry in this country is a very definite one: there would be no Government control or interference of any kind. On the contrary, the Petroleum Executive was out to render every assistance in order to foster its development."

MESSRS. LEVER BROTHERS, it is announced, have acquired the entire whaling business and outfit of the Southern Whale Fishing Co., Ltd., of which Messrs. R. Irvin & Sons, of North Shields and Aberdeen, are managing directors. The purchase price is reported to be about £750,000. This company, established eight years ago, is the only English firm engaged in the Southern Seas whale fishing. By this latest deal Lever Brothers acquire a first-hand source of supply for material necessary in soap manufacture and in the production of margarine at their new Gretna works.

MR. B. MOUNT JONES, M.A., has been appointed Professor of Chemistry at the University College of Wales, Aberystwyth, in succession to Professor Findlay (resigned). Mr. Jones, who was for six years Professor of Chemistry at the Government College at Lahore (India), joined the Army as a private at the outbreak of war, and rose to the rank of lieutenant-colonel, being appointed director of the Central Laboratory at General Headquarters. In France he was decorated with the D.S.O., and was three times mentioned in dispatches. He dealt with defence against poisonous gases and with the systematic investigation of all materials used by the enemy in chemical warfare.

THE DEATH TOOK PLACE RECENTLY, in Berlin, of Dr. Max Delbrueck, a leading chemist of Germany. For many years he had been the chief of the Institute for Ferment Industries and the Manufacture of Starch. This institution was his life's work. It is important not only from a purely scientific but also from an economic standpoint. Dr. Delbrueck was born in 1850. After graduating from Griefswald University in 1872, he went to Halle, where he joined the staff of an experiment station established for the manufacture of alcohol. The institute which Dr. Delbrueck conducted to the end of his days was an offspring of the Halle experiment station. Dr. Delbrueck surrounded himself with a staff of seventy scientists, chemists, biologists, physiologists specialising in food, engineers and economists. He himself, as a chemist, concentrated his work on the study of enzymological changes of potatoes, barley and leaven at their different stages of preparation and fermentation.

THE FOLLOWING INFORMATION shows the extent to which the sugar industry has suffered in France and Germany from the effects of the war. The coming season in Germany will see about fifty fewer raw sugar factories in operation than in 1913, and the area under sugar beet is said to have declined by about 19.4 per cent., the weight and sugar content of the crops being also seriously below the average. In France the damage has, of course, been on a vastly larger scale. Before the war there were 250 factories turning out one million tons of sugar annually. Of this about three-quarters was consumed in France, the remaining quarter being exported. The invaders destroyed 150 factories, and to-day the production of sugar is less than 150,000 tons per annum. The world sugar supply has fallen greatly below the demand, and will apparently continue to fall. It will be seen, therefore, how urgently necessary it is that England should produce, as well as consume, sugar, and no longer be wholly dependent upon imported supplies.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

BOILERS. Efficiency of boilers and power distribution for gas works. W. H. Postlethwaite. *Gas J.*, September 30, 720-722. Sources of loss are pointed out and suggestions made for their prevention.

CARBONISATION. Low temperature carbonisation and the fuel of the future. I. *Gas World*, September 27, 240-241.

COAL. Deterioration in the heating value of coal during storage. H. C. Porter. *J. Soc. Chem. Ind.*, September 30, 346R. A reply to criticisms of Bulletin 136 of the U.S. Bureau of Mines.

DYES. The Japanese dyestuff industry. *J. Soc. Chem. Ind.*, September 30, 347R. Statistics and other data are given showing the expansion of the industry.

FUEL. The British Association discussion on fuel economy. *Gas World*, September 27, 235. A consideration of some of the points raised in the discussion.

MUSTARD GAS. W. J. Pope. *J. Soc. Chem. Ind.*, September 30, 344-345R. The history of the manufacture of mustard gas is given.

WHITE LEAD. Some microscopical features of white lead. J. Scott. *Chem. Trade J.*, September 27, 327-328.

Colonial

COPPER. Nodulising copper concentrate. O. Lachmund. *Bull. Canadian Min. Inst.*, September, 950-954. The successful use of powdered coal for this purpose is described.

FUEL. Fuel resources of Alberta. R. D. MacLaurin. *Canadian Chem. J.*, September, 289-291. Available supplies of coal, oil, and natural gas are discussed.

Use of benzol and benzol mixtures as motor fuel. I. C. Mackie. *Canadian Chem. J.*, September, 295-297. The conditions of combustion when benzol is used as fuel are shown by exhaust gas analyses.

IRON. Determination of iron in battery acid by the ferric thiocyanate colour. E. Nyman. *Canadian Chem. J.*, September, 298-300. The application of this colorimetric process to the sulphuric acid used in lead storage batteries is described.

POTASH. Potash recovery at cement plants. A. W. G. Wilson. *Bulletin No. 29, Mines Branch, Canada Dept. of Mines* (34 pp.). An amplification of a paper previously published (*J. Soc. Chem. Ind.*, 1919, 314T. See also CHEM. AGE, p. 282), giving fuller statistics and illustrations. Also p. 437 of this issue.

American

BOILERS. Saving coal in steam boiler plants. *U.S. Bur. Mines, Tech. Paper* 217 (8 pp. and diagrams). The underlying principles of boiler control are discussed. This is a reprint of *Engineering Bulletin No. 2*, prepared by the U.S. Fuel Administration in collaboration with the Bureau of Mines.

GAS. A portable cubic-foot standard for gas. M. H. Stillman. *U.S. Bur. Standards, Tech. Paper* 114 (13 pp., price 5 cents). A new type of volume standard for measuring gas is described.

MERCURY. Fume and other losses in condensing quicksilver from furnace gases. L. H. Duschak and C. N. Schuette. *U.S. Bur. Mines, Tech. Paper* 96 (29 pp., 5 cents). An investigation of the magnitude of these losses has been carried out.

French

BERYLLIUM. The beryllium industry. H. Copaux. *Chim. et Ind.*, August, 914-916. Notes on beryllium ores, extraction of beryllium from beryl, and uses of beryllium compounds.

EXPLOSIVES. Flameless powders. J. Delpech. *Comptes rend.*, September 22, 537-539. An account of experiments on the use of various carbonaceous substances to reduce the flame of explosives.

FERROSILICON. Contribution to the study of ferrosilicon. A. Sanfourche. *Rev. Mét.*, May-June, 217-224. A physico-chemical study of various grades of ferrosilicon.

MAGNESIA. Separation and determination of magnesia in presence of fixed alkalis. P. Nicolardot and F. Dandurand. *Rev. Mét.*, May-June, 193-199.

MANGANESE. Determination of manganese in special steels by the persulphate method, in presence of chromium and tungsten. P. Nicolardot and A. Levi. *Rev. Mét.*, May-June, 201-216.

MUCORS. Methods of using *Mucedanæ* in agricultural industries. A. Delemar. *Chim. et Ind.*, August, 892-898. Historical account of some applications of mucors.

PLANT. Notes on the use of stoneware in chemical industry. M. Kaltenbach. *Chim. et Ind.*, August, 899-913. Useful paper on the construction of stoneware apparatus, making joints with other materials, &c.

SULPHONATION. New process for the sulphonation of benzine hydrocarbons. A. Guyot. *Chim. et Ind.*, August, 879-891. The hydrocarbon in the form of vapour is brought in contact with the sulphonating acid.

Miscellaneous

FATS. Deglycerination of fats by the Twitchell process. P. Bertolo. *Annali Chim. Applic.*, vol. 12, Nos. 1-4, 27-50.

GLYCERIN. Purification of commercial glycerin. P. Bertolo. *Annali Chim. Applic.*, vol. 12, Nos. 1-4, 24-27.

VASELINE. Analysis of vaseline. G. Armanni and A. G. Rodano. *Annali Chim. Applic.*, vol. 12, Nos. 1-4, 50-51.

Lawes' Chemical Manure

Improved Shipping Facilities Needed

MR. E. G. CUBITT, presiding at the meeting of Lawes Chemical Manure Co., Ltd., last week, said that he must frankly tell the shareholders that during the war it had been impossible, through want of labour and material, to maintain the works at the standard at which they considered they should be maintained, and a very considerable outlay would be required in the near future.

As to the future, the general position in the country was so very uncertain that it was impossible to give an accurate forecast. The difficulty of getting raw material had been acute for some time and showed no signs of improvement. That was due to the reduced output of raw phosphates in North Africa and to the scarcity of tonnage to bring phosphates from America to fill the shortage. While serious complaints were being made of congestion at the ports by the importation of goods not immediately required, the fertiliser trade had not been able to induce the Shipping Controller to provide tonnage for raw phosphate, which, in London at any rate, would not increase the congestion, as delivery would be taken from the ships in the river direct into the manufacturers' premises. This curtailment was not only going to have a serious effect upon home supplies of fertilisers for the coming season, but had prevented British manufacturers from taking a share in the very large demand for export. The loss of the export trade had a doubly prejudicial effect; it reduced employment and had an adverse influence upon the national balance-sheet, and a golden opportunity was being lost.

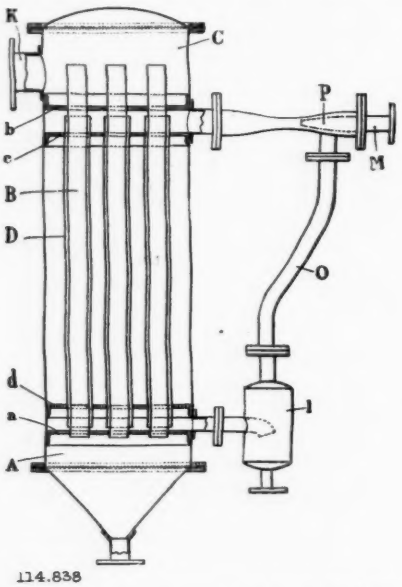
Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

114,838. Tubular Evaporating, Condensing and Cooling Apparatus. E. Barbet et Fils et Cie, 5, Rue de l'Echelle, Paris. International Convention date (France), March 31, 1917.

The apparatus is designed to improve the efficiency of tubular condensers for cooling vapour of water, alcohol, petrol, petroleum spirits, etc, or for other purposes in which an interchange of heat between a vapour and a liquid takes place. The tubes B are arranged vertically in a cylindrical casing and project through the flat plates *b*, *c* and *a*, *d* at the top and bottom respectively. All the tubes are open at both ends and project into the spaces



114.838

C and A. Each tube B is surrounded by a slightly larger tube D which opens into the two spaces between the plates *b*, *c* and *a*, *d*. The liquid to be treated enters by the pipe K and flows down through the tubes B, while the vapour is introduced by the pipe M and injector P, and passes downward through the annular space between the tubes B, D, thus ensuring better transmission of heat. Vapour and condensate pass into the separator I, and any uncondensed vapour is drawn up through the pipe O by the injector P and passed again through the apparatus. A fan may be substituted for the injector.

118,635. Evaporating Apparatus. K. L. A. Thunholm, 21, Vestra Gatan, Orebro, Sweden. Application date, August 23, 1918.

The apparatus is for evaporating liquids which tend to coagulate on concentration. It comprises a series of superposed flat sections 1 each having a hollow floor between the plates 2, 3. A vertical shaft 7 is journalled in the top and bottom plates 5, 6, and carries revolving scrapers 11 in each compartment. The shaft passes through a series of tubular collars 22 placed eccentrically so that each is staggered relatively to the adjacent collars. Liquid to be concentrated enters by the pipe 15 and is partly evaporated in the first compartment by means of a heating medium which is supplied from the main 18 and exhausted to the main 21. The liquid is kept in motion by the recessed scrapers 11 and overflows into the next compartment by weirs 14 which are alternately on opposite sides as shown. The concentrated liquid is finally withdrawn by the pipe 17. Vapour

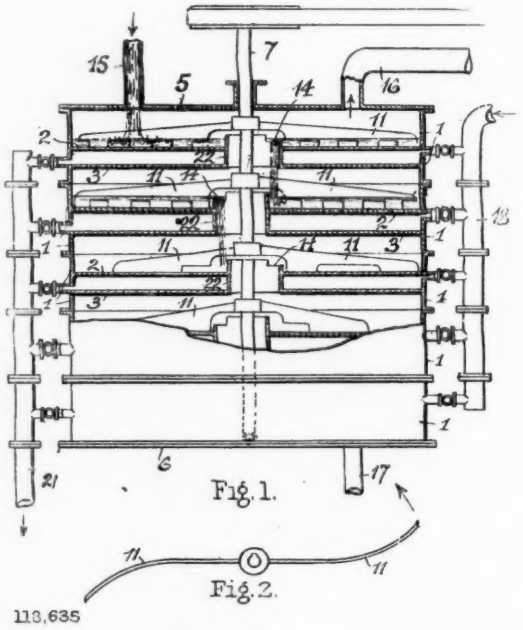


Fig. 1.

Fig. 2.

118,635

from each compartment escapes upward through the central openings and finally escapes by the pipe 16.

120,039. Regenerative Furnaces of the Soaking Pit Type. Ch. M. Stein et Cie., 3, Rue d'Edimbourg, Paris. International Convention date (France), September 8, 1917.

In a regenerator furnace for heating ingots, a separate regenerator is provided for each soaking pit and a cleaning pit common to all the soaking pits. The air passes through the regenerator, and after meeting the combustible gas at the top of the pit, the combustion products pass over the upper part of the ingots and back over the lower parts to the regenerator, and finally to the smoke collector. The flues for each pit are controlled by separate dampers. The common cleaning pit is adjacent to all the soaking pits.

121,452. Purifying Liquids, Process for. A. Rialland, 12, Rue de Hedon, Rennes, France. International Convention date (France), December 10, 1917.

Liquid such as waste lubricating oil is treated with a tannin-gelatin-alkali solution obtained from tanned leather waste and caustic soda, allowed to stand, agitated, and then slightly acidified with sulphuric acid and filtered. Metal salts and suspended particles are thereby removed.

127,833. Mixing Liquids in Closed Vessels. E. D. Hansen, 24, Kronprinsessegade, Copenhagen K, Denmark. International Convention date (Denmark), March 21, 1917.

Liquid which fills a container may be agitated by means of a disc sliding on a vertical rod, so that when the container is inverted the disc passes from one end to the other and circulates the liquid.

127,940. Fuel in Briquetted Form, Preparation of—for Utilisation in Carbonisation, Gasification, and the like. W. E. Davies, Brynawel, Vicarage Road, Penygraig, South Wales. Application date, May 31, 1918.

Coal briquettes are made by compressing the coal with a resinous binder up to 10 per cent. If the coal itself contains a

bituminous binder, the amount of binder added should bring the total to 6 to 18 per cent. of the finished briquette. The briquettes are made with a large surface by perforating or otherwise, and are carbonised under a suction of 0.25 to 12 inches of mercury. Coke of better quality is thereby produced. The coal used should have a volatile content of 10 to 40 per cent.

131,609. NITROGEN COMPOUND FROM THE NITROGEN OF THE ATMOSPHERE, OBTAINING. C. J. Montgomery, 105, Argyle Road, Saltcoats, Ayrshire, and E. R. Royston, Tower Building, Water Street, Liverpool. Application date, June 30, 1916.

Hydrogen or a hydrocarbon oil or spirit is brought into contact with a catalyst, preferably consisting of asbestos impregnated with osmium, in the cylinder of an internal combustion engine immediately after the ignition of the combustible mixture. The ammonia gas thus formed may be recovered from the exhaust gases by treating them with sulphuric acid in an absorption tower and crystallising the ammonium sulphate formed.

131,628. GLYCOLS, PRODUCTION OF. Dr. C. Weizmann, 67, Addison Road, Kensington, London, W. 14, and E. G. Bainbridge, 5, Leicester Street, Ashton-under-Lyne. Application date, June 3, 1918.

Dichloroparaffins, which have their chlorine atoms associated with different carbon atoms, are treated in aqueous suspension in an autoclave with aluminium hydroxide, lead carbonate, calcium carbonate, borax, or sodium bicarbonate, at a temperature of 100° to 200° C. Dichlorobutanes may be similarly treated.

131,642. LIQUID NITROGEN PEROXIDE AND NITRIC ACID, PROCESS FOR THE MANUFACTURE OF. W. R. Bousfield, St. Swithins, Hendon, and Nobel's Explosives Co., Ltd., 195, West George Street, Glasgow. Application date, July 2, 1918.

Nitrogen peroxide obtained by the ammonia oxidation process or the electric arc process is extracted from the gaseous mixture by scrubbing it with strong nitric acid at a temperature of about —10° C. The nitrogen peroxide is recovered from its solution by distilling it and condensing the gas. The nitrogen peroxide in solution in nitric acid may be oxidised into nitric acid by emulsifying it with oxygen in perforated trays in a tower in the known manner. Reference is directed, in pursuance of Sect. 7, Subsect. 4, of the Patents and Designs Act, 1907, to Specification 1,143 of 1911.

131,647. CELLULOSE ACETATES, PRODUCTION OF SOLUTIONS OF—AND METHODS OF JOINING ARTICLES MADE OF CELLULOSE ACETATE. R. Gilmour, 40, Ulsterville Avenue, Belfast, and Wm. Dunville & Co., Ltd., Distillery Street, Belfast. Application date, July 4, 1918.

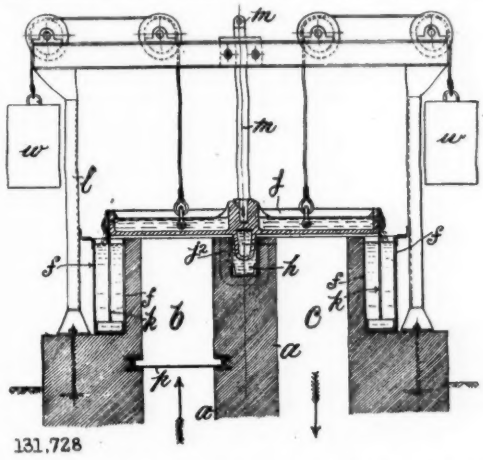
Cellulose acetate is dissolved in acetic aldehyde alone or mixed with other solvents, such as glacial acetic acid, acetone, ethyl acetate, or with non-solvents, such as ethyl or methyl alcohol, benzole, amyl, butyl or isobutyl acetate. The above mixture of solvents and/or non-solvents may be used as a cement for joining articles made of cellulose acetate.

131,684. HYDROGEN, NITROGEN, AND CARBON DIOXIDE, MANUFACTURE OF. J. Harger, Grange Hollies, Gateacre, Lancashire, and Lever Brothers, Ltd., Port Sunlight, Cheshire. Application dates, August 1 and November 15, 1918.

The ordinary steam-iron process for the production of hydrogen is used, and the spent gas remaining after the reduction of the iron oxide by water gas is utilised for heating the iron material by means of the heat produced by chemical reaction. The hot, spent gas from the iron is passed over hot copper oxide arranged in close proximity to the iron, so that reduction to copper takes place. Air or air and steam is then passed over the copper to re-oxidise it with evolution of heat. The carbon dioxide thus obtained from the spent gas and the nitrogen obtained from the re-oxidation of the copper may be separately collected. Several modifications of this method are described by which the heat produced may be utilised.

131,728. GAS PRODUCERS, FURNACES, AND THE LIKE, GAS REGULATING VALVES FOR. W. Simons, The Firs, Newcastle-under-Lyme, and I. B. Evans, 16, Linley Road, Harpfield, Hartshill, Stoke-on-Trent. Application date, August 28, 1918.

The flue *b* leading from the gas producer and the flue *c* leading to the furnace are separated by a diametrical partition *a*. A deep annular water tank *f* is provided around the flues, and a more shallow tank *h* along the top of the partition. The valve *j* is constructed with a shallow water-container to keep it cool, and with downward projections *k* and j^2 to form water-seals within the tanks. The valve is balanced by weights *w*, and its operating spindle *m* is not liable to the action of the hot gases. A damper *p* is provided in the flue *b*. The valve is completely closed when in



its lowest position, but when raised, the projection j^2 is lifted out of the tank *h*, and the two flues *b*, *c* are then connected, so that gas may then pass from the producer flue to the furnace flue. The valve is water-sealed in the tank *f* in all positions.

131,750. LIME AND BROMINE, COMPOUND OF—AND A PROCESS FOR ITS MANUFACTURE. J. S. Arthur, 99, Southfield Road, Oxford, and L. G. Killby, 43, South Eaton Place, London, S.W. Application date, September 9, 1918.

Bromine is absorbed by slaked lime, and the red powder thus produced is heated to a temperature not exceeding 100° C. Bromine and water are driven off, leaving a yellow powder having the composition $CaO.CaOBr_2.H_2O$. This product may be used as a bactericide, and has similar properties to those of chloride of lime, but is stable up to 100° C.

131,767. ELECTRIC FURNACES. The British Thomson-Houston Co., Ltd., 83, Cannon Street, London, E.C. (from the General Electric Co., Schenectady, N.Y., U.S.A.). Application date, September 20, 1918.

In an electric furnace the electrodes are moved by an electric motor, which is controlled by an electromagnet which is responsive to variations of the voltage across the electrodes. The electromagnet is controlled by a resistance which is in circuit with it, and a pyrometer in the furnace varies the resistance by means of an electric motor controlled by the movable arm of a galvanometer.

131,772. CHROME LIQUORS AND SALTS, PROCESS OF MANUFACTURING. J. R. Blockey and Wm. Walker & Sons, Ltd., Rose Hill Tannery, Bolton, Lancs. Application date, September 28, 1918.

Sodium or potassium bichromate is treated to make chrome liquors for tanning or dyeing purposes, with reducing agents such as spent tanning materials, *e.g.*, spent bark, nuts, &c., waste chrome leather or vegetable leather produced by tanning with vegetable material, waste sludge from the bottom of tan pits, or the dried or purified products, such as bloom, ellagic acid, phlobaphenes, &c., or dust from tanning material extraction plant. The bichromate is acidified with sulphuric or hydrochloric acid, and the waste tannery product then added. Reference is directed, in pursuance of Sect. 8, Sub-sect. 2, of the Patents and Designs Act, 1907, to Specification 120,049.

131,788. WASHED COAL AND THE LIKE, MEANS FOR EXTRACTING WATER OR OTHER LIQUIDS FROM—PARTICULARLY APPLICAELE FOR FINE COAL FOR COKING. C. Burnett, Sunnybank, Trowbridge, Wilts. Application date, November 1, 1918.

The washed coal to be dried is fed from a hopper having an adjustable opening on to the lower end of an inclined travelling belt of substantially greater width than the opening. The coal is carried upward, and is compressed between the inclined travelling belt and another belt just above, which is caused to bulge downward by means of rollers. The belts are formed of metal plates, which may be plain, perforated, corrugated, or serrated. Liquid is expressed by the pressure of the two belts on the coal. In an alternative form, the washed coal may be discharged on to the belt by a screw conveyor.

International Specifications Open to Inspection

130,312. FIBRO-CEMENT SLABS, &c. Naamlooze Vennootschap Hollandsche Asbest-Cement-Fabriek, 7, Sluisweg, Schiedam, Holland. International Convention date, July 20, 1918.

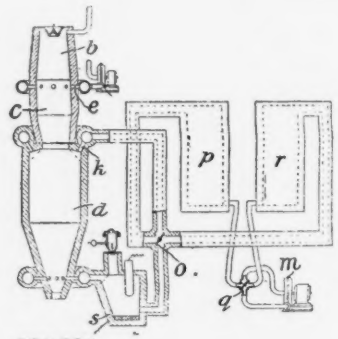
Cellulose fibre or hair which is to be mixed with Portland cement is previously treated with a fluosilicate, sodium silicate, or other salt containing silica. The Portland cement may itself contain sufficient colloidal silicic acid to saturate the fibre.

130,314. FURNACES. Soc. Anon. G. Bailly-Mathot, Rue des Grands-prés, Chenee-lez-Liége, Belgium. International Convention date, July 25, 1918.

The grate of a furnace is provided with a fixed plate below it, having openings of uniform size. A slide moves below the plate, and may be operated from the front of the furnace. The slide is provided with openings, which decrease towards the rear, so that the air supply through the grate may be regulated progressively.

130,334. METALS, EXTRACTING. F. M. Wiberg, Bergsskolan, Falun, Sweden. International Convention date, July 23, 1918.

Ore is fed into the pre-heating chamber *b*, and passes down into the reducing chamber *d*, which is supplied with reducing gas from a producer *s*, heated electrically. Part of the gas passes up through the chamber *b*, where it is burnt with air admitted at the



130,334

openings *e* to pre-heat the ore. The remainder of the gas passes out by the openings *k*, and is returned through the producer. A reversible valve *o* diverts the gas to one of a pair of regenerators *p*, *r*, in which it is cooled before passing through the blower *m*, and the gas is re-heated by the other regenerator on its way to the producer.

Latest Notifications.

132,771. Separating a Salt from its Solution by Evaporation, Process and Apparatus for. P. Piccard. September 14, 1918.

132,785. Melting Furnaces and Crucibles, Lids for. Akt.-Ges. Brown, Boveri, et Cie. September 14, 1918.

132,787. Coarsely Crystalline Substances, Manufacture of—from solutions thereof. Aktieselskapet de Norske Saltverker. September 16, 1918.

132,794. Grinding and Disintegrating Machines. J. Wolters-dorf. August 29, 1917.

Specifications Accepted, with Date of Application

118,848. Suction-gas Scrubbers and Coolers. W. Hart. August 28, 1917.

119,038. Washing Coal and Concentrating Ores and Minerals. T. M. Chance. August 27, 1917.

119,235. Kilns or Shaft Furnaces. C. Candlot. March 23, 1917.

120,551. Platinized Asbestos, Manufacture of. G. Frabetti. November 5, 1917.

131,930. Alkali Percarbonates, Manufacture of. H. Wade. (*Deutsche Gold—and Silber—Scheideanstalt vorm. Roessler.*) August 20, 1917.

131,938. Volatile Solvents used in Manufacture, Process for the Recovery of. J. H. Bregeat. November 29, 1917.

131,942. Oxidation of Ammonia, Process for the. J. R. Partington and E. K. Rideal. April 10, 1918.

131,956. Sodium Sulphate from Solution, Removal of. F. A. Freeth and H. E. Cocksedge. May 31, 1918.

131,964. Cyanides, Production of. N. Testrup and Techno-Chemical Laboratories. July 3, 1918.

131,970. Sulphonic Acids, Production of. H. D. Gibbs, J. A. Ambler, and Seldon Co. July 8, 1918.

131,998. Zinc Solutions Preparatory to the Recovery of Zinc by Electro-deposition, Treatment of. Electrolytic Zinc Co. of Australasia Proprietary. August 17, 1917.

132,023. Smelting-furnace. F. B. Dehn. (*National Lead Co.*) September 2, 1918.

132,069. Tunnel Furnaces. A. Bigot. November 8, 1917.

132,080. Electric Resistance Furnaces for Heating Gases. J. Simon and P. F. Sarron. September 24, 1918.

132,081. Electric Furnaces. T. H. Watson & Co., H. A. Greaves, and H. Etchells. September 25, 1918.

132,120. Catalytic Reactions, Apparatus for. G. Calvert. May 13, 1918.

132,164. Carbonaceous Materials suitable for use as Filtering-media or for the Preparation of Filtering-media, Method of Manufacturing. J. Wetter (*M. Weinrich*). January 31, 1919.

132,183. Fuel of the Briquette Type. W. C. Cash. March 4, 1919.

Company News

ASSAM OIL.—The directors have declared an interim dividend for the half-year ended June 30 last at the rate of 7 per cent. per annum on the Cumulative 7 per cent. Participating Preference shares, payable October 1 to holders registered September 24.

BELL'S UNITED ASBESTOS.—The directors have declared an interim dividend on the Ordinary shares of 1s. per share, less tax (being at the rate of 10 per cent. per annum), on account of the profits for the current year, payable October 21.

LONDON & THAMES HAVEN OIL WHARVES.—Interim dividend of 8 per cent. per annum (9 3-5d. per share), less tax, on Ordinary for half-year, payable October 7. Last year, 5 per cent. per annum.

SOUTH AFRICAN CARBIDE & BY-PRODUCTS.—The South African Carbide & By-Products Co., is offering for subscription 300,000 7 per cent. Cumulative Participating Preference Shares of £1 each (income tax free up to 6s. in the £). The company has been formed by the Chemico Electric Co., Ltd., for the purpose of manufacturing calcium carbide and of extracting motor spirit, tar oil, and other by-products from coal and shale at Ballengeich Colleries, Natal, South Africa. The company will also manufacture ammonium sulphate. The Chemico Electric Co., Ltd., was formed in 1914 for the purpose, amongst others, of promoting the manufacture and use of chemical products, gas and electricity, and since its formation Messrs. Harper Brother & Co., the consulting engineers, who hold a large number of shares and debentures in that company, have investigated and tested the process to be adopted by the new company for the distillation of coal and the recovery of by-products therefrom.

ST. HELEN'S PETROLEUM.—The report of this company (the whole capital of which is owned by the Kern River Co.) to May 31st last states that the net profit during the year, after charging all administration and other expenses, but before making provision for depreciation, amounted to £160,210, and £1,679 was brought in, making £161,898. Of this sum there has been transferred to provide for depreciation of plant, machinery, &c., and for redemption of cost of leases, £44,680; to suspense account, McLeod lease, £93,934, leaving a balance of £23,284, out of which there has been paid a dividend at the rate of 7½ per cent, absorbing £16,380, and leaving £6,904 to be carried forward.

UNITED ALKALI CO.—The United Alkali Co.'s works at Flint have been acquired by Courtaulds, Ltd., manufacturers of crepe and dress fabrics and artificial silk yarns. In a letter to the Mayor of Flint Mr. M. Muspratt, chairman of the United Alkali Co., says Courtaulds acquire the whole of the works at Flint and substantial developments will no doubt be made. The prosperity of Flint will in no way suffer by the transfer. Flint, he adds, has ceased to be the best district for heavy chemicals, and the company have had to recognise that fact.

VAN DEN BERGHS.—Interim dividend of 10 per cent., less tax, payable October 2.

STEEL CO., OF CANADA.—The Equitable Trust of London, Ltd., have received a cable from the above company announcing that the directors have declared the regular dividend of 1¾ per cent. on the Preference shares, and 1½ per cent. on the Ordinary shares for the quarter to September 30, payable November 1 to holders of record in Montreal October 10.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, October 2, 1919.

THE chemical market, owing to the strike, has been practically at a standstill in regard to new business.

Some heavy premiums have been paid for goods that can be delivered by road, and it is satisfactory to observe the efforts being made by many manufacturers to keep their works going. It is, of course, quite impossible to yet attempt to estimate the effect of the strike on the trade as a whole, but we are afraid that the result will be that higher prices must be looked for in a number of products.

Steamer sailings have been stopped to this country from America as a temporary measure, and this will, of course, affect the market for those goods which are being imported from the U.S.A.

Quite a number of export orders have come to hand but in the majority of cases these have to be refused owing to the impossibility of naming an approximate date for delivery.

In the ordinary way this number would contain our extended monthly report, but owing to the nominal character of the markets we have decided to postpone the monthly report until next week when the general position can be more accurately estimated.

General Chemicals

ACID ACETIC is extremely scarce, and premiums have been paid of a nominal price for spot delivery ex store.

ACID OXALIC is slightly steadier, as arrivals from the Continent are not very large as yet.

ARSENIC is very firm and scarce.

COPPER SULPHATE is quiet, and there is no business of note to record.

LEAD ACETATE has been in fair demand, and is firm at recent figures.

LITHOPONE is active, and the price is expected to be firmer owing to the cessation of shipments from America.

SODIUM CAUSTIC.—There has been a keen demand for this material, and higher prices have been paid for material that can be delivered by road.

SODIUM HYPOSULPHITE is also firmer, especially so for the photographic quality.

SODIUM PRUSSIATE has again sharply advanced in price for delivery on the spot.

Coal Tar Intermediate Products

There are no changes of note to record, but a very satisfactory business has been transacted, especially for forward delivery. The demand for export is also encouraging.

ANILINE SALT is firmer, and there are a number of orders in the market.

ALPHA NAPHTHOL is active, and works cannot now give immediate delivery.

BETA NAPHTHOL.—Some considerable orders have again been placed, and manufacturers are actively engaged.

BETA NAPHTHYLAMINE.—The demand for this intermediate has slightly improved. Prompt deliveries can be made from works.

PARA TOLUIDINE.—A fair business has been transacted in this article.

PHTHALIC ANHYDRIDE is somewhat slow of sale at recent figures.

Heavy Coal Tar Products

Owing to the railway strike normal business is at a standstill, although high prices have been paid for small lots where prompt delivery could be arranged.

The prices indicated below are more or less nominal, and in view of the uncertain situation manufacturers will not quote for forward business.

BENZOL.—The home trade price has stiffened a little, and the nominal price f.o.b. for export is 1s. 11½d.

CREOSOTE.—There is a fair demand, and prices are indicated at 5½d. to 6d. per gallon in the North and 6d. to 6½d. per gallon in the South.

CRESYLIC ACID.—The price remains steady at 2s. 4d. to 2s. 5d. per gallon for the pale 97 per cent. quality, and dark is quoted at 2s. 3d. to 2s. 4d. at works.

NAPHTHALENE.—£6 10s. per ton for crude, and about £17 to £18 for refined.

SOLVENT NAPHTHA.—There is a fair demand, business having been done at 2s. 3d. in the North and 2s. 5d. in London.

PITCH.—Business has been reported at 80s. to 85s. f.o.b. London, 75s. f.o.b. East Coast, and 67s. 6d. to 70s. f.o.b West Coast.

Sulphate of Ammonia

There is no change.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone, pure	ton	95	0	0	to	97	0	0
Acid, Acetic, glacial, 99-100%	ton	85	0	0	to	90	0	0
Acetic, 80% pure	ton	65	0	0	to	67	10	0
Carbolic, cryst. 39-40°	lb.	0	0	9½	to	0	0	10
Citric	lb.	0	4	4	to	0	4	5
Lactic, 50 vol.	ton	66	0	0	to	68	0	0
Lactic, 60 vol.	ton	83	10	0	to	85	0	0
Oxalic	lb.	0	1	2	to	0	1	2½
Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Tannic, commercial	lb.	0	3	0	to	0	3	3
Tartaric	lb.	0	3	2½	to	0	3	3
Alum, lump	ton	17	10	0	to	17	15	0
Aluminium, sulphate, 14-15%	ton	14	0	0	to	14	10	0
Aluminium, sulphate, 17-18%	ton	17	10	0	to	18	10	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	35	0	0
Ammonia, carbonate	lb.	0	0	6½	to		—	
Ammonia, muriate (galvanisers)	ton	44	0	0	to	45	0	0
Ammonia, nitrate	ton	55	0	0	to	57	10	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Arsenic, white, powdered	ton	62	0	0	to	64	0	0
Barium, carbonate, 92-94%	ton	12	0	0	to	13	0	0
Chloride	ton	23	0	0	to	24	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	13	10	0	to	14	0	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	21	10	0	to	22	10	0
Chloride	ton	8	10	0	to	9	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cobalt oxide, black	lb.	0	7	9	to	0	8	0
Copper sulphate	ton	40	0	0	to	44	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom Salts (see Magnesium Sulphate)								
Formaldehyde 40% vol.	ton	145	0	0	to	150	0	0
Iron perchloride	ton	32	0	0	to	34	0	0
Iron sulphate (Copperas)	ton	4	12	6	to	4	15	0
Lead acetate, white	ton	82	10	0	to	84	0	0
Carbonate (White Lead)	ton	51	0	0	to	55	0	0
Nitrate	ton	58	0	0	to	59	0	0
Lithophone, 30%	ton	45	0	0	to	46	0	0
Magnesium chloride	ton	15	0	0	to	16	0	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	11	10	0	to	11	10	0
Sulphate (Druggists')	ton	17	0	0	to	17	10	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	98	0	0	to	100	0	0

	per	£	s.	d.		£	s.	d.
Potassium Chlorate	lb.	0	1	1	to	0	1	2
Meta-bisulphite, 50-52%	ton	210	0	0	to	220	0	0
Nitrate refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	3	3	to	0	3	6
Prussiate, yellow	lb.	0	1	8	to	0	1	9
Prussiate red	lb.	0	6	0	to	0	6	3
Sulphate 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	0	0	to	—		
Seconds	cwt.	3	15	0	to	—		
Sodium acetate	ton	50	0	0	to	51	0	0
Arsenate, 45%	ton	60	10	0	to	62	0	0
Bicarbonate	ton	9	10	0	to	10	0	0
Bisulphite, 60-62%	ton	32	0	0	to	33	0	0
Chlorate	lb.	0	0	6½	to	0	0	7
Caustic, 70%	ton	21	0	0	to	21	10	0
Caustic, 76%	ton	23	10	0	to	24	0	0
Hyposulphite, commercial	ton	18	10	0	to	19	0	0
Nitrite, 96-98%	ton	58	0	0	to	60	0	0
Phosphate, crystal	ton	28	0	0	to	29	0	0
Prussiate	lb.	0	0	9½	to	0	0	10
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	22	0	0	to	22	10	0
Sulphite, crys.	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
,, Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	38	0	0	to	40	0	0
Tin perchloride, 33%	lb.	0	2	4	to	0	2	5
,, Protochloride (tin crystals)	lb.	0	1	9	to	0	1	10
Zinc chloride 102 Tw.	ton	22	0	0	to	23	0	0
Chloride, solid, 96-98%	ton	60	0	0	to	62	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	6	to	0	2	9
Aniline oil, drums free	lb.	0	1	1	to	0	1	2
Aniline salts	lb.	0	1	5½	to	0	1	6½
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	3	9
Benzidine, base	lb.	0	5	6	to	0	6	0
Benzidine, sulphate	lb.	0	4	9	to	0	5	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	1	9	to	0	2	0
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	8	0
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	2	0	to	0	2	3
Dinitrotoluol	lb.	0	1	10	to	0	2	0
Dinitrophenol	lb	0	1	3	to	0	1	6
Dimethylaniline	lb	0	2	9	to	0	3	0
Diphenylamine	lb	0	3	0	to	0	3	3
H-Acid	lb.	0	10	6	to	0	11	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb	0	3	6	to	0	3	9
Naphthylamin-di-sulphonic acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	1	10	to	0	2	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	6	0	to	0	7	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	6	to	0	2	8
Salol	lb.	0	4	9	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	2	to	0	1	3
Tolidine, base	lb.	0	9	0	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Sept. 24	Oct. 1
Alby United Carbide Factories, Lim., Ord.	1/16–1 1/16	1/16–1 1/16
Associated Portland Cement Manufrs. (1900.) Lim., Ord.	9⅜ 9⅝	8¾–9¼
Bell's United Asbestos Co., Lim., Ord.	2 7/32–2 11/32	2¼–2¼
Bleachers' Association, Lim., Ord.	1 1/16–1 9/16	1⅛–1⅛
Borax Consolidated, Lim., Prefd. Ord.	4½–5	4½–5
Bradford Dyers' Assoc. Lim., Ord.	2 5/16–2 7/16	2¼–2¼
British Aluminium Co., Lim., Ord.	1 5/8–1 3/4	1 49/32–1 33/32 xd
British Oil and Cake Mills, Lim., Ord.	2 11/32–2 13/32	2 3/16–2 5/16
British Portland Cement Manufrs., Lim., Ord.	33/0–35/0	1⅜–1½ d
Brunner, Mond & Co., Lim., Ord.	2¼–2⅜	2¼–2⅜
Castner-Kellner Alkali Co., Lim.	2⅝–2⅞	2⅝–2⅞
China Clay Corporation, Lim., Ord.	¼–⅜	¼–⅜
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.	57–61	57–61
Courtaulds, Lim.	10¾–11¼	10–11
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce.	1 1/16–1 1/16	1 1/16–1 1/16
Curtis's & Harvey, Lim.	2 9/16–2 13/16	2 9/16–2 13/16
Electro Bleach and By-Products, Ltd., 7% Pref.	.. ..	.. ..
Explosives Trades, Lim., Ord.	20/3–20/9	20/6–21/0
Field (J. C & J.), Lim., Ord.	⅝–¾	1½–1¾
Greenwich Inlaid Linoleum (Fredk Walton's New Patents) Co., Lim., Ord.	17/32–21/32	17/32–21/32
Harrisons & Crosfield, Lim., 10% Cum. Prefd. Ord.	1 11/32–1 13/32	1 1/16–1 1/16 d
India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.	16½–17½	16½–17½
Lawes' Chemical Manure Co., Lim., Ord.	5½–6½	½–5¾
Lever Bros., Lim., 6% Cum. "A" Pref.	19/4½ 19/10½	19/–19/9
Do. 6½ % Cum. "B" Pref.	20/0–20/6	20/0–20/6
Magadi Soda Co., Lim., Ord.	27/32–31/32	13/16–15/16
Manganese Bronze and Brass Co., Lim., Ord.	11/16–13/16	11/16–13/16
Maypole Dairy Co., Lim., Defd. Ord.	13/16–7/8	13/16–7/8
Mond Nickel Co., Lim., 7% Cum. Pref.	1–1⅛	1–1⅛
Do. 7% Non. Cum. Pref.	15/16–1 1/16	15/16– 1/16
Pacific Phosphate Co., Lim., Ord.	4⅞–5⅛	⅞–⅞
Power-Gas Corporation, Lim., Ord.	¾–⅞	¾–⅞
Price's Patent Candle Co., Lim.	87–97	90–95
Salt Union, Lim., Ord.	1 7/16–1 9/16	1 7/16–1 9/16
United Alkali Co., Lim., Ord.	1¼–1½ xd	1¼–1⅛
Val de Travers Asphalte Paving Co., Lim.	1–1⅛	1–1⅛
Van den Berghs, Lim., Ord.	3 9/16–3 13/16	3⅜–3⅝ xd
Walkers, Parker & Co., Lim.	1 5/32–1 9/32	1⅛–1¼
Welsbach Light Co., Lim.	2–2¼	2–2¼

Gas, Iron, Coal and Steel

Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	37/0–38/0	36/6–37/6 xd
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.	23/0–25/0	22/0–24/0
Gas Light and Coke Co., Ordinary Stock (4% Stand.)	58–61	58–61
Hadfield's, Limited, Ordinary	38/0–40/0	38/0–40/0
South Metropolitan Gas Co., Ordinary (4% Stand.)	59–62	59–62
Staveley Coal & Iron Co., Lim., Ord.	1 15/16–1 15/16	1⅞–1⅞
Vickers, Limited, Ordinary	34/6–35/6	33/6–34/6

Mines, Nitrate, &c.

Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	15–15/6	15–15½
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.	88–93	88–93
Lagunas Nitrate Co., Lim.	1⅛–1⅜	1⅛–1⅜
Rio Tinto Co., Lim., Ord. (Bearer)	50–52	52–54
Tarapaca and Tocopilla Nitrate Co., Lim.	16/6–17/6	16/0–17/0

Oil and Rubber

Anglo-Java Rubber & Produce Co., Lim.	6/9–7/3	6/7½–7/1½
Anglo-Maikop Corporation, Ltd., Ord.	6/3–7/3	6/3–7/3
Anglo-Malay Rubber Co., Lim.	13/9–14/3	13/6–14/0
Anglo-Persian Oil Co., Lim., Cum. 6% Part.	1 1/16–1 3/16	1 1/16–1 3/16
Burmah Oil Co. Ltd., Ord.	14⅜–14⅝	13⅝–13⅞
Chersonese (F.M.S.) Estates, Lim.	3/10½–4/1½	3/10½–4/1½
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	9 23/32–9 47/64	8 15/16–9 7/32
"Shell" Transport and Trading Co., Lim., Ord.	9⅛–9¼	8 7/8–8 11/16
Do. 5% Cum Pref.	9½–9¾	9¼–9⅜

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE.

Bankruptcy Information

RIDGWAY, John Alfred, residing at Clifton Villa, Stamford Road, Mossley, Lancs., works chemist. First meeting, October 9, 3 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, October 31, 11 a.m., Town Hall, Ashton-under-Lyne.

Companies Winding up Voluntarily

HENRITE EXPLOSIVES, LTD.—Mr. Francis James Livesey, 42, Essex Street, Strand, London, Chartered Accountant, appointed Liquidator.

SAN MIGUEL COPPER MINES, LTD. (In Liquidation).—Mr. Ernest Johnston, of Salisbury House, London, appointed Liquidator.

Liquidators' Notices

ARAMO COPPER MINES, LTD.—A meeting of creditors will be held at 2, Metal Exchange Buildings, E.C., on Friday, October 3, at 2.15 p.m.

NEW OIL PROPERTIES, LTD.—A general meeting of members will be held at 34, Bishopsgate, London, E.C. 2, on Friday, October 31, at 12 noon. R. M. Allan, Liquidator.

THE SAN ANTONIO IRON ORE CO., LTD. (In Voluntary Liquidation).—A general meeting of members will be held at the registered office of the Company, Basildon House, Moorgate Street, London, E.C., on Monday, October 13, at 12 noon. Frederick W. Frigout, Liquidator.

THE WOHLE MINERAL OIL PRODUCTS (1910), LTD.—The final general meeting of the above company will be held at the offices of Messrs. Edwin Hard & Co., Chartered Accountants, 17, Fenchurch Street, E.C., on Friday, October 31, at 12 noon. Edwin Hard, Liquidator.

Order Made on Application for Discharge

HALL, John Thomas, 28 and 30, Bolton Road, Atherton, lately of 1, Wilkinson Street, and 55, Bradshawgate, Leigh, Lancs., dry-salter. Discharge suspended for two years. Bankrupt to be discharged as from July 9, 1921. Date of Order, July 9, 1919.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

LIVERPOOL SACCHARINE AND VESTA OIL AND CAKE MILLS, LTD., LIVERPOOL.—Registered September 19, £22,000 debentures; general charge. *Nil. June 19, 1919.

MILLOM & ASKAM HEMATITE IRON CO., LTD., MILLOM.—Registered September 17, Trust Deed dated September 4, 1919, supplemental to Trust Deed of August 1, 1919, for securing £132,000 debenture stock charged on messuage or dwelling-house with outbuildings, &c., being 5, Dalton Road, Askam-in-Furness.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

ANGLO-TRINIDAD PETROLEUM CO., LTD., 13, Copthall Court, E.C. 2.—To acquire any oil rights and turn same to account. Nominal capital, £100 in 100 shares of £1 each. Directors: To be appointed by subscribers. Qualification of Directors, 1 share.

ARCHIBALD STEVENSON & CO., LTD., 23, Philpot Lane, E.C.—To carry on the business of manufacturing soap, lubricating oils and grease. Nominal capital, £30,000 in 30,000 shares of £1 each. Directors: A. Stevenson, Carntyne, Glasgow; W. Macrae, Royal Park Buildings, Stewarton; R. T. Walker, Viewfield, Stewarton; J. Kimber, 23, Philpot Lane, E.C. Qualification of Directors, £100. Remuneration of Directors, £100 each.

ASTRA STEEL AND IRON CO., LTD.—Iron, steel, metal, hardware and general merchants. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors: C. T. Brooker, Kingston Kineton Road, Olton; W. P. Hackney, Elmcroft, Station Road, Kenilworth. Qualification of Directors, £100. Remuneration of Directors, £25 each.

CEMENT DEVELOPMENT, LTD., 1, Broad Street Place, E.C.—Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: To be appointed by subscribers. Qualification of Directors, 1 share.

DIRECT FILM TRADERS, LTD., 62, Wardour Street, W.—Manufacturers and dealers in cinematograph films. Nominal capital, £10,000 in 10,000 Ordinary shares of £1 each. Directors: J. Knowles, Hungerford, Erdington, Birmingham; S. Laurence, 62, Wardour Street, W.; F. Laurence, 62, Wardour Street, W. Qualification of Directors, 10 shares.

DONALD CAMBPELL & CO., LTD., 10, St. Mary Axe, E.C.—Wax and oil merchants. Nominal capital, £500,000 in 499,700 Ordinary shares of £1 each, and 300 Employe's shares of £1 each. Directors: Right Hon. Sir H. S. Samuel, M.P.; R. Pollak; J. D. Campbell; G. I. Campbell; G. C. Skeates. Qualification of Directors, 1,000 shares. Remuneration of Directors, £250 each.

INDIAN METAL CO., LTD., 20, Coptnall Avenue, E.C.—Iron and steel merchants. Nominal capital, £12,500 in 10,000 Cumulative Participating Ordinary shares of £1, and 50,000 Management shares of 1s. each. Directors: To be appointed by subscribers. Qualification of Directors, 1 share. Remuneration of Directors, £100 each. Chairman, £150.

JOHN WHEELDON & CO., LTD., 90, Eyre Lane, Sheffield.—Oil refiners, tallow melters, grease makers, &c. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: H. Wheeldon, 86, Netheridge Road, Sheffield; E. D. Hall, 9, Thompson Road, Sheffield. Qualification of Directors, £500.

LONDON ASBESTOS AND MOTOR COMPANY, LTD., 17, Dacre Street, Westminster, S.W. 1.—Manufacturers of asbestos in all forms, &c. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: D. G. Shrubsall, 69, Woodbourne Avenue, Streatham, S.W. 16; H. J. Bullen, 22, Ormonde Road, East Sheen, S.W 14; R. E. Alexander, 24, Grainger Street West, Newcastle-on-Tyne. Qualification of Directors, other than First Directors, £100. Remuneration of Directors, £250, to be divided.

MANBRE SUGAR AND MALT, LTD.—To acquire and carry on the business of manufacturing and dealing in sugar glucose, flaked maize and malt extracts. Nominal capital, £400,000 in 400,000 shares of £1 each. Minimum subscription, 10 shares. Directors: A. Boake, High Standing, Loughton, Essex; A. E. Berry, Rowgardens Wood, Charlwood, Surrey; A. V. Courage, Bolney Place, Bolney, Sussex, and five others. Remuneration of Directors, £250 ac; chairman, £300.

McDOWELL'S COMMERCIAL FILMS, LTD., 213, Shaftesbury Avenue, W.C.—To manufacture and produce cinematograph films. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: To be appointed by subscribers. Qualification of Directors, one share.

MEADOWS OPTICAL CO., LTD., 128, Junction Road, Upper Holloway, N. 19.—Manufacturers of scientific instruments. Nominal capital, £5,000 in 4,000 8 per cent. Cumulative Preference shares of 5s. each, and 4,000 Ordinary shares of £1 each. Directors: H. W. Meadows, 62, Pemberton Gardens, Upper Holloway, N. 19; H. H. Meadows, 79, Ealing Road, W. 5. Qualification of Directors, 1 share. Remuneration of Directors, £20 each.

MIDLAND METALLURGICAL, LTD., Norfolk House, 36, Cannon Street, Birmingham.—Manufacturers, importers, exporters and dealers in ferrous and non-ferrous metals. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: D. G. Page, Pinley Whole Road, Sutton Coldfield; N. S. Woolley, Hyde House, Park Crescent, Bromhall Road, Sheffield. Qualification of Directors, 50 shares.

M.S.M. SYNDICATE, LTD., 13, Copthall Court, E.C. 2.—Oil producers and oil well proprietors. Nominal capital, £5,0 5 in 5,000 Ordinary shares of £1 and 500 Founders' shares of 1s. Directors: To be appointed by subscribers. Qualification of Directors, other than First Directors, £100.

NEW SILVER NITRATE CO., LTD., 61 and 62, Chancery Lane, W.C.—Manufacturers of nitrate of silver. Nominal capital, £2,000 in 2,000 Ordinary shares of £1 each. Directors: B. A. Chapman, Belpa Cottage, Shepperton; J. B. Alexander, 62, Water Lane, Brixton; H. A. H. Spinney, 4, Barrack Road, Hounslow. Qualification of Directors, 20 shares.

PARAGON CHEMICAL CO., LTD., The Paragan Chemical Works, Boxenden, near Accrington.—Dye manufacturers and chemical manufacturers. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: J. A. Harding; S. Webster; W. G. Hall. Qualification of Directors, £50.

PENGWERN QUARRIES, LTD.—To acquire mines, minerals and quarries of granite, slate and other stone, and turn same to account. Nominal capital, £10,000 in 10,000 "A" shares of 5s., and 30,000 "B" shares of 5s. each. Directors: R. F. Sandon, 1A, Sloane Court, S.W.; A. M. Thomas, 14, Grosvenor Street, W.; J. Johnston; B. F. Jones.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Palma, Majorca (Balearic Islands)	Essence of aniseed	766
Hongkong ..	Sulphate of ammonia, dyes, drugs, and industrial chemicals	744
Canada (Montreal)	For sale: sulphur, sulphuric acid, zinc oxide, soda ash.	
Czecho-Slovakia..	Metals; materials for tanning leather; phosphates and other materials for manures.	755
Central and South America	Drugs	784

Scottish Malt Distillers.—The profit and loss account, including the sum brought in from the previous year, shows a balance of £22,669. The directors place £3,000 to depreciation and recommend a dividend of 5 per cent. on Ordinary shares, free of tax, payable November 1, carrying forward £4,790.

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SPECTROSCOPES, MICROSCOPES, bought, sold, and exchanged. List free. John Browning, 146, Strand, W.C.

VACUUM DRYER.—For Sale, Rotary (Devine make), Cylinder about 26 ft. long × 6 ft. diameter. Jacketed, and fitted with Central Drying Tube. Complete with all Gearing. Can be seen at Works.—Address Box No. 24, Chemical Age Offices, 8, Bouverie Street, London, E.C.4.

Situations Vacant.

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

MANAGER required for Carbonic Acid Gas Works, with complete knowledge of gas compression, commercial experience desirable. Apply Box 22, Chemical Age Offices, 8, Bouverie Street, E.C. 4.

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Notices

(Three lines, 3s.; each additional line, 1s.)

INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND.
QUALIFICATIONS FOR PROFESSIONAL CHEMISTS.
The Institute of Chemistry was founded in October, 1877, and incorporated by Royal Charter in June, 1885, to provide qualifying diplomas (F.I.C. and A.I.C.) for professional, analytical, consulting, and technological chemists. Examinations will be held at the laboratories of the Institute during January, 1920. The list will be closed on Monday, 24th November, 1919. Exact dates and other particulars will be forwarded to candidates whose applications have been accepted by the Council and who intend to present themselves. Regulations for the Admission of Students, Associates, and Fellows, Gratis.—All communications to be addressed to the Registrar, The Institute of Chemistry, 30, Russell Square, London, W.C.1.

OIL AND COLOUR CHEMISTS' ASSOCIATION.
The first meeting of the 1919/1920 session will be held at the Food Reform Club, 2, Furnival Street, Holborn, London, E.C., on Thursday, October 9th, 1919, at 7 p.m. Two papers will be given by Mr. A de Walle entitled (*a*) Notes on the permeability of Paints and Varnishes, (*b*) A Suggested method for calculation of costs of Ready Mixed Paints. The Council of the Association will be pleased to welcome to this meeting chemists engaged in the Oil and Colour industries.

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